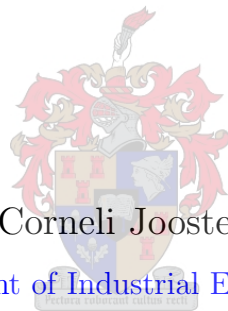


# Performance Measurement Framework for the South African Wine Supply Chain: An Investigation of Packaged Products in the Local Market



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Thesis submitted in partial fulfilment of the requirements for the degree of  
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*M.Eng Industrial*

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## Declaration

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Date

March 2016

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## List of Publications

Jooste, C., van Eeden, J. & van Dyk, FE. (2015). South african wine supply chain performance measurement framework. In W. Kersten, T. Blecker & C. Ringle, eds., *Innovations and Strategies for Logistics and Supply Chains*, vol. 20, 306 - 332, Hamburg International Conference of Logistics.

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## Abstract

The South African wine supply chain was investigated to consider improvement of the industry through performance measurement. Private and producer cellars struggle to improve supply chain activities due to the lack of useful information. Managing a supply chain is often challenging due to a lack of clear goals and strategies as well as insufficient knowledge of current performance. This project focused on investigating packaged products in the local market and aimed to develop a performance measurement framework that would provide a practical solution to improvement.

The research method that is presented describes how an agile design methodology was used to develop a performance measurement framework. Through a process of interviews, discussion groups and practical measurements, industry and academic feedback continuously provided insight into the research problem and solution. Existing performance measurement frameworks were also used to select metrics from and describe a process for formulating a supply chain strategy.

Performance measurement can be used as a tool to collect information for making supply chain decisions and it is also a source of feedback on current performance. The results from the performance measurement process during the project show that challenges regarding the availability of supply chain data exist, but valuable information concerning industry practices and processes was received. The characteristics of the industry could therefore be identified from the process and used to develop a performance measurement framework.

The local industry can be described as a complex environment where inventory management is critical. Inventory management drives the strategy of a cellar and impacts cash-flow and customer service. Most cellars therefore decide to keep high levels of finished goods inventory. Outsourcing of transportation and packaging is also a common practice.

Performance metrics were selected based on the characteristics of the industry, information required for supply chain decisions and key performance indicators for supply chain management. Metrics of the framework are categorised according to the attributes of the Supply Chain Operations Reference model.

As a whole, the project provided a method through which metrics can be used to improve performance by understanding the industry and formulating strategies. The outcome of the process is however dependant on the availability of more information. Implementation of the recommended framework implies that the performance metrics must be measured and used as part of decision making. In this way the success can be achieved in improved customer service, efficiencies, financial returns and other formulated goals.

## Opsomming

Die Suid-Afrikaanse wyn voorsieningsketting is ondersoek om die verbetering van die bedryf deur middel van prestasiemeting te oorweeg. Privaat- en produsentekelders sukkel om aktiwiteite wat deel vorm van die ketting te verbeter, as gevolg van die gebrek aan toepaslike inligting. Dit is dikwels uitdagend om aktiwiteite van 'n ketting te bestuur weens n tekort aan duidelike doelwitte en strategie, asook onvoldoende kennis van die huidige prestasie. Hierdie projek fokus op die ondersoek van verpakte produkte in die plaaslike mark en mik om 'n prestasie metings raamwerk te voorsien wat 'n praktiese oplossing vir verbetering voorstel.

'n Aanpasbare navorsingsmetode is gebruik vir die ontwerp van die metings raamwerk. Deur 'n proses van onderhoude, besprekingsgroepe en praktiese metings, kon industrie en akademiese terugvoer voortdurend insig lewer tot die navorsingsprobleem en oplossing. Bestaande raamwerke is gebruik om metings te kies asook om aan te dui hoe 'n strategie geformuleer kan word.

Deur die huidige prestasie te meet kan inligting beskikbaar gestel word om die huidige situasie te evalueer, maar ook om besluite vir die toekoms te neem. Die resultate van die metings wat tydens die projek geneem is, toon dat uitdagings ten opsigte van data beskikbaarheid bestaan. Waardevolle inligting oor die praktyke en prosesse van die bedryf is wel ontvang. Die kenmerke van die industrie kon dus geïdentifiseer word en is gebruik om 'n prestasie metings raamwerk te ontwikkel.

Die plaaslike industrie kan beskryf word as 'n komplekse omgewing waar voorraad bestuur krities is. Die bestuur van voorraad dryf die strategie van 'n kelder en beïnvloed kontantvloei asook dienslewering. Die meeste kelders besluit dus om hoë vlakke van klaarprodukte voorraad te stoor. Uitkontraktering van vervoer en verpakking is ook 'n algemene praktyk.

Die prestasie metings is gekies op grond van die eienskappe van die industrie, inligting wat benodig word vir besluitneming en die metings wat as hoof drywers van voorsieningskettings bestuur gesien word. Metings van die raamwerk is ingedeel volgens die eienskappe van die Supply Chain Operations Reference model.

In die geheel verskaf die projek 'n metode waardeur metings gebruik kan word om prestasie te verbeter deur toepaslike inligting beskikbaar te stel en strategie te formuleer. Die uitkoms van die proses is egter afhanklik van die beskikbaarheid van meer inligting. Implementering van die aanbevole raamwerk impliseer dat die prestasie statistieke gemeet moet word en gebruik word as deel van besluitneming. Op hierdie wyse kan sukses behaal word in verbeterde kliëntediens, effektiwiteit, finansiële mikpunte en ander doelwitte.

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# Nomenclature

## Acronyms

|       |  |
|-------|--|
| BPR   | Business Process Re-engineering                  |
| CEO   | Chief Executive Officer                          |
| IDOS  | Inventory Days of Supply                         |
| KWV   | Kooperatiewe Wijnbouers Vereniging               |
| LMP   | Logistics Master Planning                        |
| MTO   | Make to Order                                    |
| MTS   | Make to Stock                                    |
| PWC   | PriceWaterhouseCoopers                           |
| ROO   | Region-Of-Origin                                 |
| SALBA | South African Liquor and Brandowners Association |
| SCC   | Supply Chain Council                             |
| UVP   | Unique Value Proposal                            |
| WISE  | Wine Industry Strategic Exercise                 |



# Chapter 1

## Introduction

South Africa is a major player in the global wine industry. As the 7th largest producer of wine, South Africa contributes 4.1% of the global production of wine (SAWIS, 2015). The wine industry of south Africa has grown tremendously over the past 15 years in terms of volume and profitability. The total amount of natural wine produced increased from 628.5 million litres in 2005 to 780.7 million litres in 2010 and 958 million litres in 2014 (SAWIS, 2014b). Other major changes in the industry during this time include the deregulation of the industry, increased exports, transformation of several cooperatives to companies and changes in the representation of the industry.

The extent to which KWV regulated the industry decreased and was removed between 1992 to 1997. The regulation of the industry by KWV kept wine prices high and created an environment where grape producers aimed to deliver grapes that achieved high yields (Fridjhon, 2014). This meant that quality often lacked since production quotas, import protection and price support were in place to prevent overproduction (Giuliani *et al.*, 2010). When KWV transformed into a company in 1997, there was no central body that regulated the industry. The structure of the industry had to change and a body that would represent wine growers, producers and wholesalers was required.

Currently the representative bodies are VinPro and SALBA. VinPro represents wine grape producers, wine producers, estates and producer cellars while SALBA represents manufacturers, distributors and trademark owners including KWV and Distell (Scholtz & Barnes, 2014). The focus of this project is on addressing the members represented

by VinPro, specifically wine producers, estates and producer cellars. Most of the wine distributed to the local market, is produced by producer cellars.

Currently there is a strong focus on the strategy and business intelligence in the industry. This focus is driven and supported by VinPro. Some of the important documents and projects that forms part of this drive is the vision 2020 research report (released in 2001), Wine Industry Strategy plan (2003) and the *Wine Industry Strategic Exercise* (WISE) currently in progress.

Basson (2015) highlighted some of the current strong and weak points of the industry, as shown in Figure 1.1. Positive characteristics are indicated in colour, while the negative aspects are indicated in grey. Market strategy, low business intelligence and uncompetitiveness are represented as grey subjects and are therefore seen as aspects that should be addressed and improved.

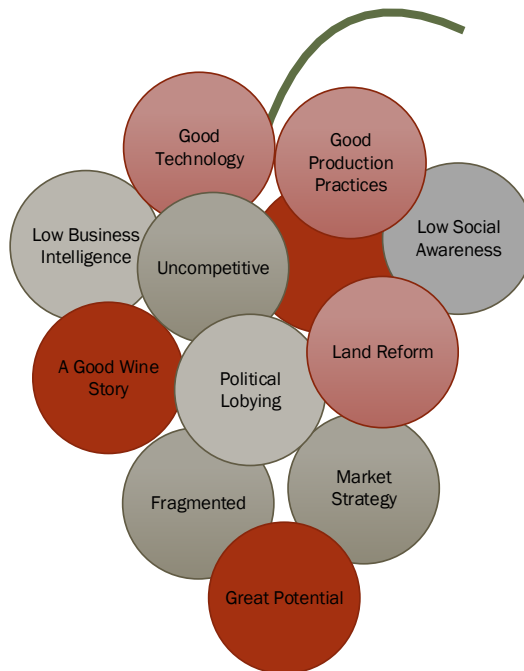


Figure 1.1: Current Wine Industry Characteristics  
Modified from Basson (2015)

The WISE initiative introduced nine projects relating to all aspects of the industry, which included supply chain analyses. Specific goals were defined for the industry and

## 1.1 Structure of the South African Wine Industry

these are aimed to be achieved by 2025. Table 1.1 presents the goals relating to supply chain management or packaged products.

Table 1.1: WISE Industry Key Drivers

| Goal                       | 2015 Reality                           | Ideal state for 2025 |
|----------------------------|--|----------------------|
| Focus                      | Production driven (80 000 ton surplus) | Market driven        |
| Local consumption          | 6l/capita                              | 9l/capita            |
| Volume handled via traders | 25%                                    | <10%                 |

Modified from (Basson, 2015)

Capturing data and information about the wine industry has been done for a long time, but setting industry goals are not common (van der Merwe, 2015). This is a step in the right direction towards using information for decision making and can help to identify the information required for supply chain decision making.

These goals are established for the industry as a whole and it has implications for various areas such as production, marketing, supply chain management, finance or research and development. Investigating supply chain management and its performance can help to achieve these goals for the industry by 2025.

## 1.1 Structure of the South African Wine Industry

The industry structure is described by the number of primary wine producers, bulk wine buyers, wine cellars crushing grapes, producer cellars, private cellars, producing wholesalers and wholesalers. The most important figures are shown in Table 1.2.

Table 1.2: Wine Industry Structure in 2013

|   |     |
|---|-----|
| Number of producer cellars                              | 50  |
| Number of private cellars                               | 493 |
| Number of producing wholesalers                         | 21  |
| Number of wholesalers (including producing wholesalers) | 103 |

(SAWIS, 2014b)

## 1.2 Industry Outlook

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A private wine cellar is a cellar that belongs to an individual or group. Producer cellars receive and process grapes on behalf of a group of wine grape producers (Scholtz & Barnes, 2014). A wholesaler is person who buys or manufactures large quantities of goods and resells to other distributors rather than to end consumers (SAWIS, 2014a). In the wine industry a producing wholesaler will be a wholesaler that also produces wine and not only resells bulk wine in a packaged form. Private cellars, producer cellars and producing wholesalers therefore crush grapes to make wine.

The wine supply chain consists of a number of important role players. These include the grape grower, cellar, suppliers of raw materials, distributors, retailers, importers and consumers. Four supply chain segments have been identified through initial segmentation of the South African market. The four segments are:

- Packaged wine for the local market
- Packaged wine for the export market
- Bulk wine for the local market
- Bulk wine for the export market

Bulk wine refers to large quantities of wine that has not been packaged yet. Packaged wine for the local market, which is the focus of this study, is mostly distributed to a variety of supermarkets and distributors (67.3%), but 30.2% is sold at restaurants or other on-trade events where the wine is consumed on the premises where it is bought (MarketLine, 2014). Other markets such as on-line sales and wine clubs account for only 2.5% of the market volume.

## 1.2 Industry Outlook

The outlook of participants of the wine industry seems to be positive, even though facing several challenges. The *South African wine industry insights survey* is an annual survey performed by PWC . It provides an overview of the performance of the wine industry by consulting the major role players in the industry. These include chief executive officers (CEOs) of private and producer cellars as well as industry bodies

## 1.2 Industry Outlook

and regulators. Role players were asked to give their outlook on the current market conditions with regard to the global wine industry as well as the South African wine industry. Figure 1.2 shows the views of CEOs and other role players on the South African wine market.

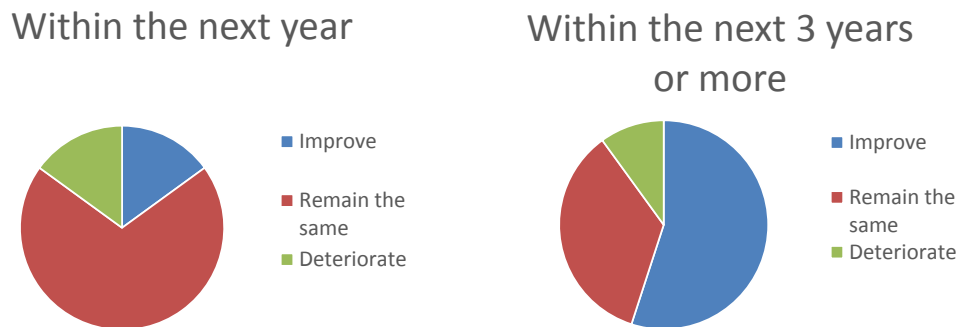


Figure 1.2: The South African Wine Industry Outlook  
Modified from PWC (2014)

The expectations of the participants for the global and South African wine industry seem to have been positive in 2014. Most of the CEOs predict that conditions will improve within the next three years, although the outlook for the coming year is not as optimistic. It can be noted that none of the role players expect a deterioration of the global wine industry within the next three years or more.

There is reason to believe that packaged wine is becoming more important in the future. Figure 1.3 indicates the view of the role players when asked whether they think the most significant opportunities for growth will come from bulk or packaged products.

There is the perception that the opportunities from packaged products will increase over the next 3 years. 21% of the roleplayers predict that the most significant opportunities for growth will come from packaged products within the next year. When asked about the the next 3 years, this percentage increases to 47% (PWC, 2014).

The growth of the local market has been slow over the past 4 years. With a 2.9 % average annual growth in value and a 1.8% growth in volume the South African

### 1.3 Supply Chain Environment of the Local Industry



Figure 1.3: The Importance of Bulk and Packaged Products  
Modified from PWC (2014)

market grew slightly faster than the global wine market which achieved 2.8% and 1.4% respectively. Over the next 5 years (2013 to 2018), the global wine market is expected to achieve a value increase of 23 % and a volume increase of 13.6%. Expectations for the local South African market are however much lower. Only 10.4% growth is forecasted for value growth and 7.3% for volume growth (MarketLine, 2014). The fact that the value is predicted to increase 3.1% more than the volume means that the average price of a bottle of wine will have to increase.

This section provided an overview of the performance of the entire industry, but has relevance to the supply chain. The roleplayers in the industry that could provide the information for this survey are also the important players that will be able to provide information for a supply chain study in the industry. Similar participants were selected for the purpose of this project and include the management of the larger producer cellars. The combination of project participants will be explained in section 1.8.

### 1.3 Supply Chain Environment of the Local Industry

This section provides an overview of the business environment in terms of sourcing, producing and delivering wine within South Africa. Focus is placed on packaged products, but in some instances the situation applies to the whole industry. The supply chain for

### 1.3 Supply Chain Environment of the Local Industry

South Africa is shown in Figure 1.4. Local and exporting channels are indicated, but more detail is provided for the local channels. The diagram is separated into source, make (production) and deliver processes and will be discussed in this order.

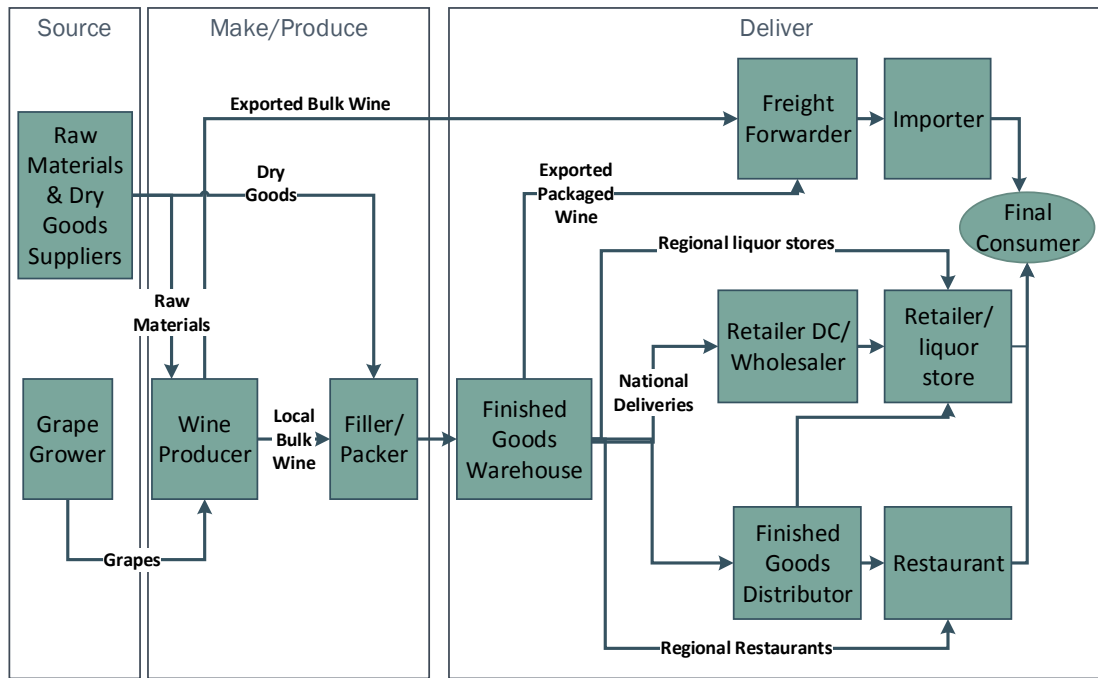


Figure 1.4: Wine Supply Chain of South Africa

#### 1.3.1 Source

Sourcing materials can be separated into grapes, dry goods and raw materials. Grapes are usually sourced from a specific pool of grape growers where close collaboration takes place. Sourcing of grapes is a strategic function since it determines the type of product and the quality to a large extent. A vineyard can produce commercially for up to 20 or 25 years (PWC, 2014). A lot of data is captured and made available on grape growing activities. Typical segmentation in this section of the supply chain includes grape varieties and regions.

Raw materials and dry goods are mostly sourced from independent suppliers that

### 1.3 Supply Chain Environment of the Local Industry

supply to a large number of customers in the wine industry as well as other industries. Raw materials are used as part of the wine making process. Dry goods are used as part of the packaging process and are sourced throughout the year. Branded or standardised dry goods can be used. Availability of dry goods are important especially if the packaging process takes place after the order is received (make-to-order inventory strategy).

#### 1.3.2 Production

Producing wine is a long process and takes several months. Figure 1.5 presents a simple illustration of the process. Grapes are crushed as soon as possible after being harvested. The exact time of harvest is difficult to determine beforehand due to the dependence on the weather. It does not take long to extract the juice and therefore the process up to here is completed soon after the grapes were received. The ageing process is a long process and can take anything from two months to two years, depending on the type of wine. Ageing can be done in steel tanks or in barrels.



Figure 1.5: The Process of Winemaking  
(Cleaveland, 2013)

The size of cellars vary significantly in terms of the volumes produced. The concept of a generic or average wine cellar cannot be defined. Not all cellars have the facilities to package their own products. It is however the responsibility of the cellar to decide about packaging if the product is to be sold as a packaged product. Wine making activities will take place at one premise and movement of the wine starts either just



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## 1.4 Background to the Research Problem

before or after the packaging process. Supply chain activities of distribution therefore seem more complex in Figure 1.4. The study of wine making, oenology, is a technical and complex field. From a supply chain management perspective the most decisions relate to the packaging process and inventory management. The volumes sold in each segment may differ from one year to the next due to characteristics of the exporting markets which include exchange rates and European harvests.

### 1.3.3 Distribution

The production and distribution of wine is mostly performed by two separate companies. The main function of a cellar is to produce wine. The various distribution functions can be performed by a cellar, distributor, retailer or other service providers. The size of a cellar may influence the scope of activities. Larger cellars could distribute their own products to national warehouses and therefore act as a distributor as well.

Various options are available for distributing wine to local consumers. For the purpose of this project, three customers were identified for cellars. These are distributors, retailers and restaurants. Other distribution channels such as cellar door sales and courier services comprises of only 2.5% of the total volume sold (MarketLine, 2014). The discussion below mentions characteristics of all local distribution channels from the cellar (finished goods warehouse) to the retailer or restaurant. Channels are indicated by arrows on Figure 1.4.

## 1.4 Background to the Research Problem

Although the wine industry is one of the oldest industries in South Africa, the concept of a wine supply chain and the management thereof is still new. Interest in the field of supply chain thinking was delayed until the industry was deregulated in 1993. During the time that the industry was regulated, wine could only be exported through one channel (Fridjhon, 2014). Deregulation opened exporting opportunities and forced cellars to create international and local market channels for their products for the first time.

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## 1.4 Background to the Research Problem

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The wine supply chain is important to the wine industry since opportunities for cost savings and business improvements can be achieved through successful management thereof. By viewing a supply chain as a strategic function, organisations can distinguish themselves from competitors based on their supply chains. Coca-Cola and South African Breweries are two beverage companies that have achieved this. Many supply chain activities are still seen as expenses only. PWC (2013) found that companies that view supply chain management as a strategic asset achieve 70% higher performance.

With support from VinPro and Winetech, it was decided to investigate the wine supply chain of South Africa over a period of three years from 2014 to 2016. The research would be conducted by Stellenbosch University within the Industrial Engineering as well as the Logistics Management departments. Part of the aim of the project was to develop a performance measurement framework and provide industry benchmarks.

The South African wine supply chain was mentioned in a publication for the first time in 2010 when Stellenbosch University conducted a survey, as part of the PWC annual financial benchmarking of wine cellars, to gather supply chain information (Stellenbosch-University & CSIR, 2010). The term is currently still uncommon to a large number of participants in the industry, but it is becoming more prevalent.

Performance measurement and benchmarking plays an important role in supply chain improvement. Performance measurement provides feedback on the current performance and it is part of the process of developing a strategy for products and markets. Benchmarking enables useful comparison to guide the goals and growth of an organisation. Performance improvement can take place when a structured approach to performance measurement exists.

In today's global world it is often not organisations, but rather supply chains that are competing against each other. The importance of supply chain wide management and alignment is therefore recognised by more and more industries.

## 1.5 Problem statement

A wine cellar forms a critical part of the wine supply chain. Wine cellars must make several supply chain decisions on an operational and strategic level. Information is required to make these decisions. Supply chain performance measurement provides valuable information for decision making. Currently the industry does not have a set of performance metrics that is prescribed to provide relevant information. Upstream and downstream visibility is restricted and it is unknown what the general expectations and performance of the industry is. Private and producer cellars struggle to improve and manage supply chain activities due to the lack of useful information and industry benchmarks. By identifying the drivers of the local wine supply chain and measuring the current performance, information could be made available for making decisions, formulating supply chain strategies and identifying the Key Performance Indicators (KPI's) of the industry.

## 1.6 Research Question

It is expected that a variety of performance measures will be required to measure the supply chain performance of a cellar. The measure that should receive the most attention will likely be determined by the scope of operations and products produced by the cellar as well as their business strategy. A cellar may have several parallel supply chain strategies.

The primary research question for this thesis is as follows: What should a performance measurement framework of a wine cellar entail to enable superior performance for distribution to the local market and how should the industry use this framework to benchmark and improve supply chain activities?

## 1.7 Research Aims

The research aims identified for the project are discussed below. Most importantly, the aim was to design a performance measurement framework. This framework should identify metrics that may enable decision making or lead to supply chain performance improvement. The drivers and characteristics of the supply chain should be used to guide the process of development.

It is important to collect data from participating cellars to measure some metrics. The current performance can be an indication of the ability of the industry to implement a performance measurement framework. In order to have benchmarks in the future, a process towards providing all the information is required. Both internal performance measurement and industry benchmarking is important to improve supply chain performance.

In order for cellars to use metrics of the framework for benchmarking purposes, an appropriate segmentation criteria must be specified. This will enable cellars to compare their performance to relevant organisations.

It is possible that the entire framework will not be implemented at once, and that some metrics will be implemented at a later stage. The metrics that are suitable for implementation during the project must be distinguished from those that will only form part of a complete and ideal framework.

The framework will aim to provide the relevant metrics that cellars should measure to obtain the information required to make supply chain decisions. Although all types of decisions are important, focus will be placed on strategic and tactical decisions. The metrics should be measured by cellars, rather than suppliers or customers, since the aim is to improve the performance of the cellars.

The scope of the project includes the development of the framework as well as the identification of the important steps required for cellars to benefit from it. Implementation of the ideal framework as well as determining the relationship between supply chain decisions and metrics is however not seen as part of the scope of this project.

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## 1.8 Project Group and Participants

### 1.8 Project Group and Participants

Industry participation on the project includes Vinpro and the Wine Industry Network for Expertise and Technology (Winetech). These two organisations provided funding for the research. VinPro is the service organisation for South African wine producer members and aims to promote and ensure the commercial sustainability of the industry. WineTech coordinates research, training and technology transfer in the wine industry.

This research project forms part of a group of projects on the wine supply chain. The research group consists of three masters students, eight final year students and a steering team guiding the research. Each masters student investigated a specific segment of the industry. The final year students performed case studies at wine cellars in 2014 and 2015 to identify and solve supply chain related issues.

The industry participants taking part in this project included 17 wine cellars in 2014. This number was increased to 22 in 2015. These wine cellars together represent 21% of the total volume of wine that is sold in South Africa. The cellars were selected based on their size, volumes per segment, business models and location. The aim was to include a variety of cellars.

### 1.9 Definition of Key Terminology

**Supply Chain Management (SCM):** SCM is defined as a network of connected and independent organisations mutually and cooperatively working together to control, manage and improve the flow of materials and information from supplier to end user (Christopher, 2011) (Aramyan, 2007).

**Benchmarking:** Benchmarking is the continuous measurement and improvement of an organisation's performance against the best in order to obtain information about new working methods or practices in other organisations (Kozak & Nield, 2001).

**Performance measurement framework:** A set of performance metrics that enables informed decision-making and execution. It enables organisations to monitor relevant performance indicators of products, services and production processes (Aramyan, 2007).

**Supply Chain Operations Reference Model (SCOR):** The SCOR model provides

## 1.9 Definition of Key Terminology

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a unique framework that links business process, metrics, best practices and technology into a unified structure to support communication among supply chain partners and to improve the effectiveness of supply chain management (SCC, 2012).

**Make to stock (MTS):** For this type of inventory management strategy, orders are replenished from finished goods. Finished goods inventory is kept so that products are ready for immediate shipment

**Make to order (MTO):** Inventory is kept as raw materials or components. When an order is received, one or more make processes must still be performed before delivery can take place.

## Chapter 2

# Fundamentals of Supply Chain Performance Measurement

Performance measurement plays an important role in managing a business and achieving the desired goals (Langley *et al.*, 2009). The purpose of performance measurement is to close the gap between planning and execution. A process of performance measurement will form part of any performance improvement project or process. Gunasekaran *et al.* (2004) further stated that the role of performance measurement is very important since it evaluates an organisation on a strategic, tactical and operational level. Within the field of supply chain management there has been a shift in focus from individual organisations to supply chain wide management. The increasing value placed on collaborative relationships with suppliers expanded the scope of supply chain management to include from all upstream suppliers and downstream customers (Gunasekaran *et al.*, 2004).

Traditionally supply chain capabilities were seen as a cost and later as a value-adding service. This changed when logistics cost increased and companies realised that the possibility exists to differentiate themselves based on their supply chain (Langley *et al.*, 2009). This also led to where superior supply chain capabilities became an order qualifier in many instances. By improving supply chain performance, organisations are therefore able to create competitive advantages that will help them to outperform the rest of the market. A performance measurement framework creates a structure through

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which performance can be improved.

The diagram in Figure 2.1 shows how the components of the literature study relate to each other and aids in understanding the flow of the document. The diagram aims to indicate how the different concepts from literature was used to address the topic of performance improvement through performance measurement. The green shapes indicate activities, while the blue blocks indicate outcomes. The following paragraphs explain how the activities and outcomes are related to each other. The aim to improve performance is present through all processes.

A supply chain strategy describes the aims of a supply chain in terms of the supply chain drivers. These drivers can be any characteristic or customer demand (Ambe, 2012). Goals can then be formulated from the strategy. In Figure 2.1, supply chain drivers are indicated in a unique colour and shape because it is the information that is required before the process can start and it shapes most of the decisions that are made.

Segmentation is used to identify the different supply chains that should be managed individually. The performance measurement framework contains all important information on the metrics that is used for performance measurement as well as benchmarking. Through industry benchmarking, best practices can be identified for a group of organisations or supply chains with similar characteristics. The results of performance measurement and benchmarking provide feedback on the implementation and execution of the strategy. It also evaluates whether the supply chain goals are achieved (Frazelle, 2002).

Planning a supply chain starts with developing an appropriate strategy. Products and services of an organisation may require different strategies based on the product, customer or other characteristics. While there are certain generic supply chain drivers, each industry has a unique combination of relevant and key drivers. An understanding of how these drivers work together can lead to successful competitive positioning (Perez, 2013).

Several types of generic supply chains have been described in literature based on the drivers. These drivers provide insight into the important aspects of a supply chain that should be considered when formulating supply chain strategies. A well defined



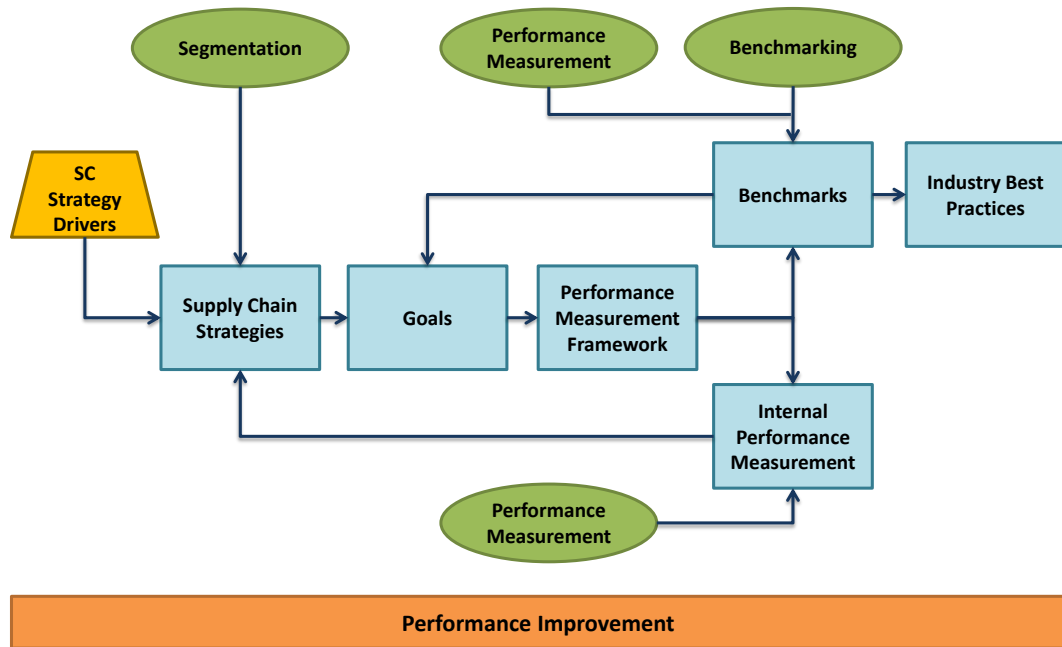


Figure 2.1: Components of the Literature Study

supply chain can benefit from performance measurement since the goal for each aspect is clear. This means that a reference is available for what is seen as acceptable, good or excellent performance in terms of the selected strategy.

Various methodologies and frameworks are available for the design and implementation of performance metrics. Since performance metric selection is a complex process, frameworks that make sense of the requirements can add a lot of value. Improving performance is the main aim of performance measurement. The information that is provided creates the opportunity and motivation for improvement (Frazelle, 2002). Sufficient improvement can be achieved when a goal has been set. Internal performance measurement and benchmarking both provide valuable information that should enable performance improvement.

The process of performance measurement, improvement and benchmarking is a very intricate and extensive process. This chapter will focus on the subjects that provide insight in the design of a performance measurement system. In some instances, specific

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## 2.1 Supply Chain Strategy

reference will be given to the wine industry of South Africa.

### 2.1 Supply Chain Strategy

A company's strategy or strategic vision is defined by the identification of the target market, product lines and core enterprise and operations capabilities (Jacobs & Chase, 2011). Strategic positioning suggests that a strategy is not only developed, but also executed. These concepts received a lot of attention in the literature during the 1980's and 1990's. Porter (1996b) stated that creating a strategy is about selecting the activities that will put the company in a unique and valuable position. The configuration of activities is therefore very important and implies that trade-offs will have to be made in order to execute a defined strategy (Porter, 1996b). This view of strategy is different to the theories from the 1970's, when a strategy was defined as the successful execution of one or two key activities such as outstanding product quality or low cost (Porter, 1996b).

Porter (1996b) developed a model for industry analysis to guide the development of a corporate strategy. The five competitive forces that shape strategy are:

- Threat of new entrants
- Bargaining power of buyers
- Threat of substitutes
- Bargaining power of suppliers
- Rivalry among existing competitors

The idea is to investigate the business environment by identifying whether these forces are low or high and then using this information to position the company where the forces are weakest (Porter, 1996a).

An organisation requires a corporate, business and operations strategy. The corporate strategy defines the principles and methods used for planning business processes including the lower level strategies. Business strategies specify the approaches and

## 2.1 Supply Chain Strategy

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principles required to implement the corporate strategies to the business units. Operational strategies determine the planning, implementing and controlling of operational processes that the organisation perform (Prašnikar *et al.*, 2005).

Depending on how the organisation is structured, different units or functions may be included in the business strategy (Prašnikar *et al.*, 2005). If the supply chain of an organisation is seen as a business unit, it will have a business strategy as well as an operational strategy. From the business strategy, an operational supply chain strategy can therefore be formulated to specify how the supply chain activities will be used to achieve financial success. The motivation to select the correct strategy is present since this can create the competitive advantages and capabilities customers are seeking (Ambe, 2012). An organisation can segment its supply chains by grouping together products and customers with the same characteristics and drivers. The use of various segmentation methods is discussed in section 2.1.1.

Frameworks that translate corporate strategies into business models and operational activities are meant to help companies decide on the activities that will be required to ensure success. One such framework and two methodologies are presented in sections 2.1.2 and 2.1.3.

Perez (2013) developed a framework and described the process that is involved in formulating new strategies or improving current strategies. This framework was used to describe some of the characteristics of the wine industry and will be explained in section 2.1.2. The APICS SCC also developed a methodology that can be followed to formulate and execute a supply chain strategy as part of a benchmarking exercise. The methodology makes use of the SCOR framework to enable the process (see section 2.1.3). Frazelle (2002) presented a method for implementing a supply chain strategy. This methodology focus on the process once the goal and strategy is known (see section 2.1.3). From all of these frameworks it can be seen that performance measurement is an important aspect of supply chain management and improvement.

The components of the business strategy are all integrated and inter dependant by nature, but success can only be achieved when they are aligned. After involvement in more than 100 supply chain improvement projects, alignment was the one characteristic that Bolstorff & Rosenbaum (2012) singled out as the key to supply chain success.

## 2.1 Supply Chain Strategy

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Aligning the supply chain strategy with other components of the business and corporate strategy is of utmost importance.

The scope of a supply chain strategy should entail all the supply chain activities. Frazelle (2002) defines supply chain logistics as the flow of material, information and money from the suppliers' suppliers to the end consumer. The actual supply chain is the network of facilities, vehicles and logistic information systems. Some of the main activities that forms part of supply chain management are listed below. These activities may be performed by different organisations.

- Warehousing and distribution centre operations
- Transportation
- Supply
- Inventory management
- Customer response

The goals and aims defined by the supply chain strategy should be translated into operational terms in order to make decisions and execute the strategy. This starts with an investigation process where the current activities are profiled, measured and benchmarked (Frazelle, 2002). The translation process is an important activity and includes a plan of the short- and long term metrics, process definitions, information system requirements and organisational requirements for the departments listed above. This planning process can be called the Logistics Master Planning (LMP), and will be discussed in more detail in section [2.1.3](#).

### 2.1.1 Supply Chain Segmentation

Products require different supply chains since they serve specific target markets. Tailoring supply chains to the specific needs of customers is important. The idea was also indicated as one of the three main messages from the PWC global supply chain survey (PWC, 2013). Supply chains can be tailored if the drivers of the chain are similar.

## 2.1 Supply Chain Strategy

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Products should be grouped together according to a selected characteristic. This process of separating and grouping products is referred to as product segmentation. A specific method of segmentation is used to select and define a supply chain strategy for a specific group of products or customers.

There are several methods for segmenting, and the purpose of each method is to separate in such a way that a defined supply chain strategy can be allocated to each segment. Some published frameworks have segmented according to the following characteristics:

- Product requirements
- Customer requirements/needs
- Uncertainty of supply
- Uncertainty of demand
- Customer buying behaviour
- Relevance of assets in total cost
- Market mediation costs

Even though segmentation methods differ from framework to framework, it is possible to identify a limited number of generic supply chain strategies. A segmentation method that makes the most sense to the organisation should be selected (Aramyan, 2007). Due to the variety of methods and the importance, selecting a method for segmenting is crucial. It is very important to segment accurately since it will lead to the supply chain strategy that is selected for the channel. The effect of applying an inappropriate strategy to a product or customer can lead to many customer, inventory or quality related problems. The most significant segmentation frameworks will now be discussed in more detail. Each framework describes the method for segmenting, the supply chain strategies recommended and how these strategies are translated into operational terms.

## 2.1 Supply Chain Strategy

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Fisher (1997) recommended that companies should design supply chains according to the demand characteristics of the products. He identified two types of products and two types of supply chains based on the demand characteristics of products. Demand characteristics categorises a product as being either functional or innovative. Functional products require efficient supply chains, while innovative products require responsive supply chains. Fisher (1997) describes a process where it is important to first determine the current product demand and supply chain characteristics. Only when this is known should a plan be developed to change the supply chain or adapt the product.

Lee (2002) expanded Fisher's classification by acknowledging that where the supply for raw materials are uncertain, a different set of practices is required. The author therefore described two additional supply chains - evolving and risk-hedging supply chains. According to Lee (2002), products with low supply uncertainty have stable processes, while products with high supply uncertainty have evolving processes (Jacobs & Chase, 2011). To take high uncertainty of supply (evolving processes) into account, the author identified a risk-hedging supply chain for functional products and an agile supply chain for innovative products. In case of low uncertainty of supply, Lee (2002) and Fisher (1997) recommends the same supply chains.

The characteristics of high and low supply/demand uncertainty can be seen in table 2.1. The characteristics of the product is used to determine which type of supply chain it will require.

The four categories for supply and demand uncertainty, as identified by Lee (2002), are shown in Table 2.2. Examples of products belonging to each category is given as well as the type of supply chain that would suit products in this category. The least difficult supply chain strategy is an efficient supply chain and the most difficult is an agile strategy.

Christopher & Gattorna (2005) formulated a framework for the development of a supply chain strategy that identified four types of buying behaviours experienced from customers. Where Fisher (1997) and Lee (2002) segmented primarily according to product characteristics, Christopher & Gattorna (2005) identified that each type of customer must be served according to relationship type and service requirements that would attain the highest customer satisfaction. The names given to the supply chains

## 2.1 Supply Chain Strategy

Table 2.1: Demand and Supply Uncertainty Characteristics

| Demand characteristics          |                                  | Supply characteristics        |                                   |
|---------------------------------|----------------------------------|-------------------------------|-----------------------------------|
| Functional<br>(Low uncertainty) | Innovative<br>(High uncertainty) | Stable<br>(Low uncertainty)   | Evolving<br>(High uncertainty)    |
| Low demand un-<br>certainty     | High demand un-<br>certainty     | Less breakdowns               | Vulnerable to<br>breakdowns       |
| More predictable<br>demand      | Difficult to fore-<br>cast       | Stable and higher<br>yields   | Variable and lower<br>yields      |
| Long product life               | Short selling sea-<br>son        | Fewer quality<br>problems     | Potential quality<br>problems     |
| Low inventory cost              | High inventory<br>cost           | More supply<br>sources        | Limited supply<br>sources         |
| Low profit margin               | High profit margin               | Reliable suppliers            | Unreliable suppli-<br>ers         |
| Low product vari-<br>ety        | High product vari-<br>ety        | Fewer process<br>changes      | More process<br>changes           |
| Higher volume                   | Low volume                       | Fewer capacity<br>constraints | Potential capacity<br>constraints |
| Low stockout cost               | High stockout cost               | Easier to change<br>over      | Difficult to change<br>over       |
| Low obsolescence                | High obsolescence                | Dependable lead<br>times      | Variable lead<br>times            |

Lee (2002)

describe the type of products or service the customer would typically require. The four types of customer segments are: Innovative solutions, demanding/quick response, efficiency/consistency and collaborative. The corresponding supply chains strategies are explained in table 2.3.

Ambe (2012) reviewed the literature on supply chain segmentation and identified that supply chain strategies have several common characteristics and the names given to the supply chains are used interchangeably. The author therefore categorised all the characteristics that has been used in the literature under one of three categories - product characteristics, manufacturing characteristics or decision drivers of a supply

## 2.1 Supply Chain Strategy

Table 2.2: Types of Supply Chains according to Supply and Demand Characteristics

| <b>Demand<br/>uncer-<br/>tainty</b> | <b>Supply<br/>uncer-<br/>tainty</b> | <b>Supply<br/>Chain</b> | <b>Supply Chain Examples</b>               |
|-------------------------------------|-------------------------------------|-------------------------|--|
| Low                                 | Low                                 | Efficient               | Grocery, basic apparel, food, oil and gas  |
| High                                | Low                                 | Responsive              | Fashion apparel, computers, popular music  |
| Low                                 | High                                | Risk-hedging            | Hydroelectric power, some food produce     |
| High                                | High                                | Agile                   | Telecom, high-end computers, semiconductor |

(Lee, 2002)

chain. Three generic types of supply chains were identified and described by each of these characteristics. This provided a comprehensive summary of the collaboration between the various frameworks and the characteristics used by each of them to segment and identify supply chain strategies. Although it is likely that deviations from the classification will occur, it is a valuable classification since it makes sense of the similarities between the frameworks in literature. It can be used as a guideline to select a segmentation method that is a combination of more than one framework. More than three supply chain strategies may however be required to represent the most important products, customers and manufacturing characteristics.

The SCOR framework, which will be discussed further in section 2.2.2, is another framework to consider for segmenting supply and demand. The SCOR framework has a much larger scope than any of the frameworks discussed above and is both a segmentation and performance measurement framework.

Supply chains are identified by listing all customers and products. Where a product is delivered to a customer, a supply chain exists. Usually this list of customer-product combinations has to be shortened by prioritising. The following criteria can be selected to prioritise:



## 2.1 Supply Chain Strategy

Table 2.3: Customer Segmentation and Corresponding Supply Chain Types

| <b>Customer Type</b>       | <b>Customer Characteristics</b>                    | <b>Supply Chain</b>      | <b>Supply Chain Characteristics</b>   |
|----------------------------|--|--------------------------|---|
| Innovative Solutions       | Supplier led development and delivery of new ideas | Fully flexible           | Hedging and deployment strategies to improve responsiveness on a selective basis  |
| Demand-ing/ Quick response | Rapid response to unpredictable supply and demand  | Agile                    | Focus on responding rapidly and commercially to unpredictable supply/demand       |
| Efficiency/ Consistency    | Consistent response to largely predictable demand  | Lean                     | Focus on economies of scale, synergies, and low cost production and delivery      |
| Collaborative              | Close working relationship for mutual gain         | Continuous replenishment | Focus on developing loyal customer relationships with trusty and reliable service |

Christopher & Gattorna (2005)

- Revenue
- Gross margin
- Number of SKU's
- Unit volume
- Strategic importance

To allocate a supply chain strategy to each of the important supply chains, the inventory model and product lifecycle stage has to be known. Specific supply chain strategies are not allocated to supply chains based on the segmentation, but guidelines are given as to which performance measures should be given first priority. Table 2.4 is used for identifying the likely priority. The likely priority provides a good guideline to

## 2.1 Supply Chain Strategy

selecting the appropriate metrics from the performance section of the SCOR framework since it indicates the attribute requiring superior performance.

The diagram states that all products that do not require any make processes should focus on assets and cost. The inventory model can be either engineer-to-order (ETO), make-to-order (MTO) or make-to-stock (MTS). The third factor is the lifecycle stage of the product which states whether the product is at the start or at the end of life (EOL). For ETO products, the likely priority will always be reliability and responsiveness. MTO products will focus on assets and reliability. MTS products will have different priorities depending on the lifecycle stage.

Table 2.4: SCOR Supply Chain Strategy Allocation

| Build Strategy | Model | Lifecycle | Likely Priority |
|----------------|-------|-----------|-----------------|
| Buy            |       |           | 1. Assets       |
|                |       |           | 2. Cost         |
|                |       |           |                 |
| Make           | ETO   |           | 1. Reliability  |
|                |       |           | 2. Response     |
|                | MTO   |           | 1. Assets       |
|                |       |           | 2. Reliability  |
|                | MTS   | Start     | 1. Flexibility  |
|                |       |           | 2. Response     |
|                |       | Middle    | 1. Cost         |
|                |       |           | 2. Reliability  |
|                |       | Commodity | 1. Cost         |
|                |       |           | 2. Assets       |
|                |       | EOL       | 1. Assets       |
|                |       |           | 2. Cost         |

(SCC, 2012)

All of the segmentation methods discussed above provide feasible solutions. The last framework, developed by Perez (2013), is the most recent and comprehensive framework. It proposes not only a method for segmentation, but describes the entire roadmap from investigating the current activities to identifying aims and gaps in order to eventually implement the changes. This framework is called the *Supply Chain Roadmap*

## 2.1 Supply Chain Strategy

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and will be discussed in section 2.1.2. Focus is placed on the translation of a supply chain strategy from the business strategy.

In the wine industry, members of the chain use different segmentation methods. The supply chain is not integrated from beginning to end and organisations often do not consider participants that are not direct customers or suppliers. For grape growers and wine producers it is often very important to segment between red and white grapes/wine or according to cultivar. This becomes much less important once the product is packaged and distributed. When a distributor or cellar sells a product, customers are often segmented according to the type of licence under which their customers will sell the wine. Restaurants require a licence that allows them to sell wine to be consumed on their premise, while a retailer would only have a licence for off-premise consumption.

### 2.1.2 Comprehensive Supply Chain Strategy Framework

The *Supply Chain Roadmap*, formulated by Perez (2013), is a framework that describes the process of formulating an appropriate supply chain strategy and then breaking it down to operational objectives. This process aims to align the business and supply chain strategies of an organisation.

What sets this framework apart from any of the other frameworks is the practical and clear guidance that is provided. The framework consists of six generic supply chain strategies as well as support on how to select one of these (according to the characteristics of the investigated supply chain). The four tools of the framework together create a roadmap for transforming to a new or revised supply chain strategy. The author addresses the fact that a supply chain strategy may or may not already exist, and that different procedures may be followed for each case.

The following four tools were developed to assist with and enable implementation of the process:

- The roadmap for defining a supply chain strategy
- Ten common supply chain patterns in industries
- Six supply chain archetypes (generic supply chain strategies)

## 2.1 Supply Chain Strategy

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- Feasibility matrix for relating to one of the generic supply chain strategies

The outcome of the process is to select one of the six archetypes or generic supply chain strategies and implement it. The roadmap provides the structure for the information that is required to make the decision and therefore states which characteristics should influence and determine the decision. The feasibility matrix explains which of the six archetypes should be selected by considering the evaluation of the relevant characteristics on the roadmap. The other common patterns can be used to improve management of certain circumstances such as challenging supply environments.

Perez (2013) stresses the fact that a supply chain strategy must be formulated before the start of the process. This means that the strategy should be written down in the companies own terms. This will ensure that the roadmap will present the true strategy of the supply chain. The aim of this process is to align the business and supply chain strategies and also to create an implementation plan for the identified performance gaps.

Throughout the framework the author distinguishes between two instances where the framework will be used - to improve positioning or to create contingency plans. Where analyses are performed to improve the positioning in the marketplace, decisions are based on the assumption that the marketplace will stay as it is and the organisation must determine which changes to the supply chain processes will put them in the best position. The other scenario is when the organisation aims to analyse possible changes in the marketplace and plan how they will react. Changes could include increased transportation costs, technology improvements or new competitors in the market (Perez, 2013).

The tools of the framework are used to enable the activities. The map is used for describing the current industry environment as well as the internal operations. A strong focus is placed on the characteristics relating to the supply chain, but also include other business aspects. The map illustrates that a supply chain strategy consists of three components - the business framework, Unique Value Proposal (UVP) and supply chain processes.

## 2.1 Supply Chain Strategy

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The business framework provides an overview of the industry landscape by describing the sourcing, technology and demand view of the supply chain. This includes characteristics such as the sourcing disruption risk, suppliers power, relevance of assets in total cost, transport cost relevance and demand variation. The UVP aims to state the organisations competitive positioning through the product and service attributes offered. Product attributes include the portfolio range, price, adaptability and innovation of the product. Service attributes refer to the time from idea to market, agility to demand variation, lead time, minimum order quantity and perfect orders. Supply chain processes describe the operations of the supply chain by looking at the sourcing, plan & make, demand fulfilment processes and also the managerial focus of these processes.

The supply chain roadmap can be seen in Figure 2.2. This example indicates what it will look like when the current situation indicated on the roadmap and compared to the characteristics of one of the six supply chain strategies.

The ten common patterns describe how some important situations should be dealt with by characterising it according to the business framework, UVP and Supply chain processes. A situation is typically described by one or two specific characteristics and then the solution is provided as the capabilities that is required to address the situation. One common pattern is evolving industries. These industries are characterised by the high market uncertainty cost and high demand variation. The ability to be agile towards demand variation is required if an organisation operate in such an industry.

The six archetypes are generic supply chain strategies. They are described according to the characteristics that form part of the map. The difference between the ten common patterns and the generic supply chains is that the patterns only refers to two or three of the attributes of a supply chain in order to address a specific situation. The generic supply chains describe how most of the attributes of a supply chain strategy could be configured to work towards a common goal.

The six generic supply chains include three types of responsive supply chains and three types of efficient supply chains. To understand what these supply chain configurations entail, the map of each supply chain is shown in appendix A.

Three supply chains oriented to efficiency:

## 2.1 Supply Chain Strategy

| Business Framework  |   |                                    |   |  |  |   |                             |                  |                            |                         |                  |                      |                            |
|---|---|------------------------------------|---|--|--|---|-----------------------------|------------------|----------------------------|-------------------------|------------------|----------------------|----------------------------|
|   | Sourcing view                                       |                                    |   |  | Technology view                                    |   |                             | Demand view      |                            |                         |                  |                      |                            |
|   | Multiplicity  | Disruption risk                    | Suppliers Power   | Cost relevance   | Maturity   | Assets cost relevance                   | Gross margins in industry   | Customer's power | Relevance in customer cost | Market uncertainty cost | Demand variation | Product renewal rate | Transport's cost relevance |
| Very high   | ○   | ○                                  | ○   | ○  | ○  | ○                                       | ○                           | ●                | ○                          | ○                       | ○                | ○                    | ○                          |
| High  | ○   | ○                                  | ○   | ○  | ○  | ○                                       | ○                           | ○                | ○                          | ○                       | ○                | ○                    | ○                          |
| Medium  | ○   | ○                                  | ○   | ○  | ○  | ○                                       | ○                           | ○                | ○                          | ○                       | ○                | ○                    | ○                          |
| Low   | ○   | ○                                  | ○   | ○  | ○  | ○                                       | ○                           | ○                | ○                          | ○                       | ○                | ○                    | ○                          |
|   |   |                                    |   |  |  |   |                             |                  |                            |                         |                  |                      |                            |
| Unique Value Proposal   |   |                                    |   |  |  |   |                             |                  |                            |                         |                  |                      |                            |
|   | Product Attributes                                  |                                    |   |  |  |   | Service Attributes          |                  |                            |                         |                  |                      |                            |
|   | Ratio benefits/ price                               | Range of portfolio                 | Product adaptability  | Price  | Innovation   | Time from idea to market                | Agility to demand variation | Working capital  | Lead time                  | Minimum order quantity  | Perfect orders   | Order entry          |                            |
| Main proposal   | ○   | ○                                  | ○   | ○  | ○  | ○                                       | ○                           | ○                | ○                          | ○                       | ○                | ○                    |                            |
| Best of the industry  | ○   | ○                                  | ○   | ○  | ○  | ○                                       | ○                           | ○                | ○                          | ○                       | ○                | ○                    |                            |
| Avg. of the industry  | ○   | ○                                  | ○   | ○  | ○  | ○                                       | ○                           | ○                | ○                          | ○                       | ○                | ○                    |                            |
| Not relevant  | ○   | ○                                  | ○   | ○  | ○  | ○                                       | ○                           | ○                | ○                          | ○                       | ○                | ○                    |                            |
|   |   |                                    |   |  |  |   |                             |                  |                            |                         |                  |                      |                            |
| Supply Chain Processes  |   |                                    |   |  |  |   |                             |                  |                            |                         |                  |                      |                            |
| Sourcing  | Plan & Make   |                                    | Demand Fulfillment  |  |  |   | Managerial Focus            |                  |                            |                         |                  |                      |                            |
| Collaboration   | Inventory strategy                                  | Product adaptability               | Collaboration   | Order cycle  | Supplier's management                              | Product design                          |                             |                  |                            |                         |                  |                      |                            |
| Strategic relationship with key suppliers to create synergies | Small and frequent batches.<br>High Inventory level | Standardized product               | Strategic relationship with key customer to build synergies | Fixed cycle  | Collaborative relationships to build synergies     | Fast changeover.<br>Low cost            |                             |                  |                            |                         |                  |                      |                            |
| Buffering   | Assets utilization                                  | Order penetration point            | Buffering   | Minimum order quantity   | Transformation process                             | Service design                          |                             |                  |                            |                         |                  |                      |                            |
| Inventory and a strategic supplier for each key component     | High - very high                                    | Make to Stock.<br>Make to Forecast | Inventory of finished product                               | Customer replenishment needs.<br>Minimum economic transportation batch | Regular basis schedule in optimal sequence of SKUs | Information sharing.<br>Perfect orders  |                             |                  |                            |                         |                  |                      |                            |
|   | Production cycle                                    |                                    |   |  |  | End to end                              |                             |                  |                            |                         |                  |                      |                            |
|   | As short as possible to reduce batches size         |                                    |   |  |  | Collaborative relationships. Efficiency |                             |                  |                            |                         |                  |                      |                            |

Figure 2.2: Supply Chain Map - Example of Future and Current States  
Modified from Perez (2013)

- Continuous-flow
- Efficient
- Fast

Three supply chains oriented to Responsiveness:

- Custom-configured
- Agile
- Flexible

The feasibility matrix shows the relationship between the supply chain archetypes and the characteristics of the roadmap. Figure 2.3 indicates these relationships. The

## 2.1 Supply Chain Strategy

current and future (ideal) states are mapped on the feasibility matrix to identify establish targets and close the gaps.

|   |                                   | Generic supply chains |               |                  |                   |              |           |
|---|-----------------------------------|-----------------------|---------------|------------------|-------------------|--------------|-----------|
| Description of Business framework (BF) or Unique Value Proposal (UVP) |                                   | Continuous flow       | Efficient     | Fast             | Custom configured | Agile        | Flexible  |
| UVP   | Agility to demand                 | Not relevant          |               |                  | Avg. or best      | Best         |           |
| UVP   | Price                             | Avg. or best          | Best          | Avg. or best     |                   | Not relevant |           |
| BF  | Demand variation                  | Low - Medium          | Medium - high |                  |                   |              | Very high |
| BF  | Relevance of assets in total cost | High - very high      |               | Medium - high    |                   | Low - medium |           |
| BF  | Market uncertainty cost           | Low - medium          |               | High - very high |                   |              |           |

Figure 2.3: Feasibility Matrix for the Supply Chain Roadmap  
Modified from Perez (2013).

### 2.1.2.1 Applying the Tools

The first step of the process is to segment supply chains. Segmentation identifies those supply chains that require a unique supply chain strategy. The next step is to describe the current and future supply chain environment and formulating strategies in terms of the appropriate characteristics. This step makes use of the supply chain map. Many of the characteristics of the business framework describe industry related situations that cannot be changed by the organisation. The UVP and supply chain processes refer to factors that can be adapted by internal decisions of the organisation.

The factors form the basic building blocks of the tools and the framework. Once the current and future state of the supply chains have been defined in terms of the factors of the roadmap, evaluation can take place. The current and future states can be indicated on the same map (see Figure 2.2).

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## 2.1 Supply Chain Strategy

The current and the desired supply chain configuration should be compared to the archetypes and patterns to identify the gaps. Differences between the compared situations are not necessarily due to poor performance, but can also result due to characteristics of the industry.

Based on the similarities between the current strategy and the generic supply chain strategies, it can be determined which generic supply chain would provide the best solution or strategy. The ten patterns are used in the same way and the information of the differences are recognised. The feasibility matrix connects the generic supply chains, the roadmap and the current situation to enable gap analysis. The feasibility matrix can be seen in Figure 2.3. With the use of the feasibility matrix an appropriate supply chain strategy is selected. The outcome of the gap analysis indicates what changes will be necessary to implement the strategy

An attractive attribute of this segmentation is the fact that there are six supply chains to choose from or to use as a guideline for good practices. There are areas where two strategies overlap and a choice can be made as to which strategy to follow. This author does not recommend that multiple supply chain strategies should be selected for one product, but rather that multiple strategies can be operated within a company.

### 2.1.3 Translating and Implementing Strategies

When a supply chain strategy is defined, it is important to know what must be done in order for it to be executed. Depending on the type of project or product, the magnitude of this process will vary significantly. If it is a single product strategy, the most time will be spent on compiling the applicable information from existing sources. If however a new strategy is selected for a whole business or unit, the planning and execution will entail more investigation and work.

The Logistics Master Planning process (LMP) is about translating the supply chain strategy into operational terms and describing the activities that will be necessary to enable implementation. The three steps of the LMP are: investigate, innovate and implement. Performance measurement and benchmarking forms part of the investigation step (Frazelle, 2002). Applying world-class practices is part of the innovation phase.



## **2.1 Supply Chain Strategy**

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Only the investigation phase will now be discussed in more detail. The first step of the

## 2.1 Supply Chain Strategy

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LMP is investigation, includes the following activities:

- profile the current logistics activity
- measure current logistics performance
- benchmark performance and practices versus world-class standards

This process uses performance measurement in order to identify the current performance gaps. The segmentation process provides some of the information for the profiling of a supply chain. A comprehensive supply chain profile consists of an activity profile for each of the supply chain activities as identified in section 2.1. An activity profile indicates the flow of all information, material and money throughout any logistic activity (Frazelle, 2002).

The Apics Supply Chain Council presents a similar process to the LMP, but the steps are more comprehensive. The seven step benchmarking process is a methodology that makes use of the SCOR framework to achieve business goals.

1. Supply Chain Definition
2. Supply Chain Prioritisation
3. Supply Chain Strategy
4. Selecting Metrics
5. Sourcing Data
6. Creating a Balanced SCORcard
7. Performing Benchmark

Depending on the purpose for investing in performance measurement, some methodologies may be more beneficial than others.

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## 2.2 Supply Chain Performance Measurement Frameworks

### 2.1.4 Overview of Supply Chain Strategy Frameworks

In a review article on determining the optimal supply chain strategy, Ambe (2012) compiled a list of 22 most important factors influencing and determining the choice of supply chain strategy. These factors are grouped into the product characteristics, manufacturing characteristics and decision drivers. The current state of these factors should influence the development of a supply chain strategy, but the supply chain strategy must be defined before selecting performance measures. This means that an evaluation of the current situation can help in the process, but there should be a clear vision of the desired supply chain strategy and the route to get there.

The selection of performance measures would be based on the selected supply chain strategy. Certain companies will benefit more from performing product level segmentation and describing a supply chain strategy for each product or customer. Neely *et al.* (1995) found that managers do not find it difficult to identify measures, but often too many metrics are selected. These authors therefore suggests that a process of reducing performance metrics should exist.

The most important aspect is getting a supply chain that fits your product (Fisher, 1997). Understanding which factors drives a specific supply chain is the main enabler of selecting the best strategy (Perez, 2013). Only when a supply chain strategy is identified can the appropriate performance measures be selected. A good performance measurement system is also dependant on practical guidelines (Gopal & Thakkar, 2012).

## 2.2 Supply Chain Performance Measurement Frameworks

In order to get to a system of performance measures for a supply chain, a framework can be used. A performance measurement system is a set of metrics that is selected for an organisation. This set of metrics should be carefully selected in order to represent the effectiveness of the organisation. Various parallel supply chains may exist within one organisation. Perez (2013) recommends that it is better to identify several supply chain strategies within an organisation than to describe one supply chain strategy that has multiple objectives.

## 2.2 Supply Chain Performance Measurement Frameworks

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The purpose of a framework in general is to give structure to a field of study (Du Toit & Vlok, 2014). An organisation or industry would use a performance measurement framework or reference model to develop a performance measurement system for their environment.

Using a performance measurement framework is not the only method to select performance measures and develop a performance measurement system. Aramyan (2007) identified and compared seven methods to assess supply chain performance. Two of the methods are frameworks, but the others are concepts such as activity based costing, multi-criteria analysis and lifecycle analysis (Aramyan, 2007).

Strategy should be seen as the main driver of performance measurement and a performance measurement system and performance measurement then plays an integral part of the implementation of a new business or supply chain strategy (Frazelle, 2002). In section 2.1, several frameworks for the development of a supply chain strategy were discussed. A number of performance measures are recommended for each of the generic supply chain strategies and these can be used as guidelines in the design of a performance measurement framework. The development of a performance measurement system is however a process on its own.

The characteristics of the specific supply chain must influence the development process since it distinguishes supply chains (Aramyan, 2007). Customer, inventory, supply, transport and warehouse profiles enables the identification of critical characteristics.

Some practical purposes of a performance measurement system include (Arzu Akyuz & Erman Erkan, 2010):

- Identifying if customer needs are met
- Better understanding of processes
- Identifying success
- Identifying bottlenecks, waste, problems and improvement opportunities
- Providing factual decisions
- Enabling progress

## 2.2 Supply Chain Performance Measurement Frameworks

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- Tracking progress
- Facilitating a more open and transparent communication and co-operation.

These purposes show how performance measurement results can be used in practical ways for formulating strategies, setting goals and improving performance. After reviewing the literature on supply chain performance measurement in 2010, Arzu Akyuz & Erman Erkan (2010) recommended a balanced approach to performance measurement. When designing a performance measurement system, a balance between the following focus areas must be achieved (Arzu Akyuz & Erman Erkan, 2010):

- Short term vs. long term.
- Internal vs. external focus.
- Different levels in an organisation (strategic, tactical and operational measures).
- Four views of the balanced scorecard (learning and growth, internal processes, customer, financials)

Depending on the framework that is used, the development process will include more or less customization in order to be applicable to the specific organisation. Generic frameworks with a broader scope may require more customisation, but may provide more support for completing the process.

The rest of this section will be used to discuss frameworks that are available to organisations and industries for the development of a performance measurement system. The focus is on measuring the performance of supply chain activities. Only the last framework that will be discussed is an industry specific framework, designed for the wine industry. Each framework has advantages and disadvantages in terms of scope, support and approach.

Gunasekaran *et al.* (2004) developed a framework with the aim of encouraging a better understanding of the importance of supply chain metrics and to increase the interest in the field. This framework mostly include metrics that was discussed in the literature at that time. The total number of metrics were limited to 46 with 11 metrics

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## 2.2 Supply Chain Performance Measurement Frameworks

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at a strategic level, 21 at tactical level and 14 metrics at an operational level. The author stated that it is important to consider and include those metrics specific to the organisation or industry since they may not be listed in the framework.

The framework groups metrics according to two characteristics and is presented as a matrix. On the y-axis, the supply chain activities (Plan, source, make and deliver) are listed and on the x-axis the level of management (strategic, tactical and operational) is indicated. At a strategic level, SCM is about transforming the way that operations meet the needs of their customers. At an operational level, SCM integrates traditional functions such as sourcing, buying, storing, making, and distributing (Du Toit & Vlok, 2014).

The metrics that are used in performance measurement and improvement should be those that truly capture the essence of organisational performance (Gunasekaran *et al.*, 2004). An important part of developing this framework was also to present a method of thinking about metrics and organising them to find a balance between the different levels in an organisation. This framework can be used for any type of supply chain, but no further support is provided in terms of strategy selection, segmentation or customisation of the metrics. In a fast changing environment such as supply chain, the fact that it is based mainly on the metrics discussed in literature could become a problem.

### 2.2.1 Balanced Scorecard

Literature sources unanimously agree on the importance of a balanced system of performance metrics that is aligned with the corporate strategy. The use of a balanced scorecard approach forms the core of a performance measurement system. The balanced scorecard is a methodology used for the identification of performance indicators and was developed by Kaplan and Norton in 1993. The balanced scorecard (BSC) approach is based on the idea that a high level strategy can be translated and implemented by selecting a few key performance indicators that will specify the required focus areas (Christopher, 2011). The organisation is viewed from four perspectives and each of the perspectives should have a goal. The processes that are influenced by this goal should be identified in order to select measurements and targets. (Kaplan & Norton, 1996b).

## 2.2 Supply Chain Performance Measurement Frameworks

The outcome of a strategic exercise with the balanced scorecard would typically look like Table 2.5.

Table 2.5: Balanced Scorecard Example

|                            | Strategy   |          |         |             |
|----------------------------|------------|----------|---------|-------------|
|                            | Objectives | Measures | Targets | Initiatives |
| <b>Financial</b>           |            |          |         |             |
| <b>Customer</b>            |            |          |         |             |
| <b>Processes</b>           |            |          |         |             |
| <b>Learning and Growth</b> |            |          |         |             |

Modified from Kaplan & Norton (1996a)

The Balanced scorecard is a framework for the development of a performance measurement system of an organisation. It does not focus only on supply chain performance nor does it aim to include multiple organisations.

In their book, *Strategy and Organization in Supply Chains*, Seuring *et al.* (2003) proposed a method for adapting the balanced scorecard so that it can be applied to multiple organisations. The balanced scorecard is not primarily a framework for inter-organisational measurements and therefore the supply chain must be seen as a single organisation or entity (Seuring *et al.*, 2003).

### 2.2.2 Supply Chain Operations Reference Framework (SCOR)

The Supply Chain Council (SCC) developed the first version of the Supply Chain Operations Reference model (SCOR) in 1996 to assist companies in increasing the effectiveness of their supply chains and to support the move to process-based management (Stewart, 1997). SCOR therefore aim to help organisations understand, describe and evaluate supply chains (Palma-Mendoza, 2014). Since then the model has been revised several times and the thirteenth and latest version (version 11) was released on 1 December 2012. Huan *et al.* (2004) described SCOR as a strategic tool that allows senior management to perform planning and to simplify the complexity of supply chain management.

## 2.2 Supply Chain Performance Measurement Frameworks

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After the focus on business process re-engineering (BPR), benchmarking and then best practices in the 1980's, the SCC developed SCOR to address a need for an integrated and cross functional tool to help manage a complex management process - the supply chain management process. SCOR combines the concepts of BPR, benchmarking and process measurement and explains how it should be applied in a common language (Stewart, 1997). The Supply Chain Council is a global non-profit organisation whose methodology, diagnostic and benchmarking tools help organizations make dramatic and rapid improvements in supply chain processes (SCC, 2012). A reference model describes, characterizes and evaluates a complex management process (Stewart, 1997).

The framework should not be seen as a list of possible processes, practices and metrics. The value of the framework lies in the relationship between the processes, metrics and practices. The scope of SCOR is very broad and therefore the framework can be used to describe almost any supply chain. The framework links business process, metrics, best practices and technology into a unified structure to support communication among supply chain partners and to improve the effectiveness of supply chain management and related supply chain improvement activities (SCC, 2012).

The SCC established the SCOR process reference model for evaluating and comparing supply chain activities and performance. The SCOR model is structured framework that enables any organisation within a supply chain to describe and document their supply chains. Once the processes of a supply chain are described according to the processes of the SCOR framework, the appropriate combination of metrics, best practices and skills can be identified. A process for performing a benchmarking study is also available.

Some of the significant characteristics of the SCOR framework includes that it is a process framework, it has a hierarchical structure, the common language it provides, the focus on supply chain integration and the scope of support provided.

SCOR is the first cross-industry framework for evaluating and improving enterprise-wide supply-chain performance and management. Since the beginning, the SCC wanted to create a framework that would become the industry standard which organisations use for improving operational effectiveness and describing processes (Stewart, 1997).



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## 2.2 Supply Chain Performance Measurement Frameworks

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To develop something so broad and yet aim for it to improve operational efficiency was definitely a challenge. The way in which the SCC achieved this was to create a hierarchical framework that describes processes and performance metrics on three levels.

Level 1 processes defines the scope of the supply chain and differentiates organisations or supply chains. Some organisations would operate in a source environment of a supply chain while others perform a make or deliver role. Level 2 processes differentiates the complexity and capabilities of businesses and processes. Level 3 processes are activities. They provide names to tasks and link metrics, tasks and practices (SCC, 2012).

The three levels of performance metrics are overall health metrics(level 1), diagnostic metrics (level 2) and root cause metrics (level 3). Level 1 metrics, which evaluate the overall health of a level 1 process, measures the ability of an organisation to execute strategies. Level 2 metrics explain why the strategy is not achieved. Level 3 metrics aim to identify the root cause of the identified strategy gap so the problem can be addresses where it originates (SCC, 2012). A common framework language is used for all of the processes of level 1 2 and 3. Although not described, the framework still recognise that each organisation must describe its own level 4 and 5 processes and metrics. These processes will describe the sequence steps as well as the transaction details of a process in an industry specific language. Measuring the performance at level 4 requires transactional performance measures that is described in a language that is specific to the technology involved (SCC, 2012).

SCOR is a process framework and is therefore designed to measure supply chains and not only single companies. This differentiates the framework from many other frameworks and addresses a need that arose when the importance of integration was realised and supply chains, rather than companies, started competing.

The four sections included in SCOR are: processes, performance, practices and people. A short description of each can be seen in the diagram below. SCOR discusses three techniques for improving performance in a business. These are business process modelling, benchmarking and the use of best practices. A process reference framework contains all these three and includes the link between them (SCC, 2012).

## 2.2 Supply Chain Performance Measurement Frameworks

Table 2.6: SCOR Dimensions and Techniques

|   | <b>SCOR Dimensions</b>  |  |   |   |
|---|---|--|---|---|
|   | <b>Processes</b>  | <b>Performance Metrics</b>   | <b>Practices</b>  | <b>People (skills)</b>  |
| <b>Technique</b>                        | Business Process Re-engineering   | Performance Benchmarking   | Best Practices Analysis   | Organizational Design   |
| <b>Description</b>                      | Capture the as-is business activity and design the future to-be state           | Quantify relative performance of similar supply chains and establish internal targets  | Identify practices and software solutions that result in significantly better performance | Assess skills and performance needs and align staff and staffing needs to internal targets                          |
| <b>This dimension help companies to</b> | Document as-is and to-be processes. Document how the supply chain is organized. | Translate the business strategy to a supply chain strategy. Measure supply chain performance. Identify processes requiring urgent improvement. | Standardise processes. Identify alternative configurations.                               | Document skill requirements Identify available skills. Identify skill gaps. Formulate individual development plans. |

(SCC, 2012)

## 2.2 Supply Chain Performance Measurement Frameworks

### 2.2.3 Performance Measurement Framework for the Wine Industry

Garcia *et al.* (2012) acknowledged the lack of literature on the wine supply chain and therefore developed a framework for measuring logistics performance in the wine industry. This framework is a combination of several established frameworks including SCOR and another model presented by E.H. Frazelle in 2002 (Garcia *et al.*, 2012). The framework considered four performance attributes and applied them to six logistics processes within the supply chain. The performance attributes can be seen in the horizontal bars of Figure 2.4 and the logistic processes are displayed in the vertical bars.

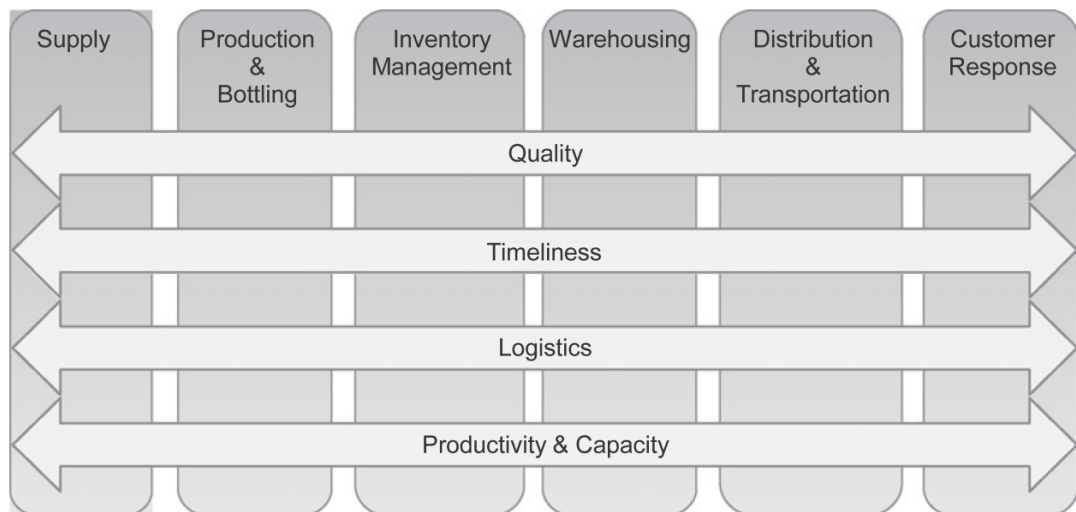


Figure 2.4: Logistics Processes and Performance Attributes  
(Garcia *et al.*, 2012)

The framework follows a logical way of selecting and measuring performance. Because the scope is narrow, the authors could provide a map of the processes included in the wine supply chain without using a generic language. As with the SCOR model, there are three levels of performance measures. Level 1 metrics will provide a winery with an overview of the performance of the entire supply chain, while level two and

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## 2.3 Supply Chain Benchmarking

three are specific to the organisation.

The framework has only been partially validated through a case study performed at 6 wineries in Argentina. This case study demonstrated the method for implementing the framework, but did not make use of all the measurements and did not represent other roleplayers than wineries.

Due to the complexities present in the wine industries, Garcia *et al.* (2012) found that it is necessary to develop a framework specifically for the wine industry. These complexities include the nature of the product (which require a mixed push/pull strategy), the number of actors and relationships between them, the multi-tier systems in distribution cycle of some countries, the requirements of consumers, the continuous pressure of local and external competitors in the market and the legal constraints of distribution. The aim of the framework is therefore to:

- help wineries understand the complexities of the wine industry
- select processes to improve
- focus on new strategies or goals
- improve supply chain and resource optimisation
- increase the final customer satisfaction

The implementation of the framework will be different for each organisation depending on the role (winery, distributor or retailer) and the strategy.

## 2.3 Supply Chain Benchmarking

Benchmarking is all about determining the performance of an organisation and then comparing it to the performance of competitors (Garcia *et al.*, 2012). This concept and tool was made known by Xerox in the 1980's, when it was used to regain market share. Supply chain benchmarking only received attention in the 1990's (Peng Wong & Yew Wong, 2008). At first benchmarking was discussed as part of the field of performance measurement, but as the concept developed various approaches and applications

## 2.3 Supply Chain Benchmarking

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were investigated. It was further identified that supply chain benchmarking is more challenging than general performance benchmarking due to the complex level of collaborative joint decision making (Peng Wong & Yew Wong, 2008). The aim of supply chain benchmarking should therefore be to investigate the integration of performance measures. The lack of infrastructure and resources to support integration in organisations makes it difficult.

Benchmarking is strongly associated with best practices and the search for those practices that will lead to superior performance (Wah Fong *et al.*, 1998). Information about best practices or working methods are identified through a continuous performance measurement process (Kozak & Nield, 2001). Several definitions have been provided in literature and there are some repeating and important concepts. These concepts will be discussed briefly.

Firstly, benchmarking is a systematic process. Part of the success and benefit can be attributed to the framework it creates for the learning experiences seen from others (Kozak & Nield, 2001). As was mentioned earlier, a framework provides structure to a field of knowledge (Du Toit & Vlok, 2014). According to Wah Fong *et al.* (1998), the driver of successful benchmarking is a systematic process. Frazelle (2002) indicated that the lack of standardisation of supply chain measurements, often makes it difficult to benchmark performance.

Secondly, benchmarking focus on the creation of business knowledge. The transformation from data to information to knowledge is very important and benchmarking provides a structure that enables this. Benchmarking compares the performance of an organisation to other organisations. It involves a systematic and continuous process for evaluating an organisation's performance by comparing it to the best. There is the risk of failure when benchmarking is used to imitate rather than to innovate. The idea of imitating another company is often associated with benchmarking. This is a risk when benchmarks are used out of context and do not lead to innovation. The aim of benchmarking is not to imitate, but to improve the quality of decision making. This should be done by comparing business information of other companies and then creating business knowledge (Prašnikar *et al.*, 2005). It is very important that benchmarking

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## 2.3 Supply Chain Benchmarking

leads to change and improvement. Best practices should be identified from the process and implemented.

### 2.3.1 Types of Benchmarking

Primarily there are three classification methods for benchmarking. Each of these identifies various types of benchmarks. Wah Fong *et al.* (1998) performed a review that identified three types of benchmarking. At this stage, benchmarking was not yet a mature tool. The three classification methods are the nature of the referent, the content and the purpose for the relationship. This defines the who (referent), what (content) and why (purpose) questions of a benchmarking study. Explanations and classifications are provided in Table 2.7. These classifications provide a good idea of the questions that should be answered when planning a benchmarking study. Depending on the situation, it is possible to use one, two or even three of the classifications for a benchmarking study.

The types of referents and content makes it clear that benchmarking is not limited to comparisons between competing organisations. Any process, function or strategy of an organisation can be compared to similar referents. The scope of referents can include any internal or global referents.

In recent years the main classification used is based on the nature of the referent to which performance is compared, and especially the difference between internal and external benchmarking as well as different types of strategic benchmarking. Internal benchmarking refers to those aspects that are measured and compared to values within the same organisation. This enables learning from success achieved within the organisation (Kozak & Nield, 2001). External benchmarking has the aim of benchmarking the performance to other organisations, which include competitors, industry partners, generic and global organisations. Strategic benchmarking aims to assess the longer term decisions of the organisation. This may include the organisational structure or policies.

Large organisations can benefit from internal benchmarking when measuring comparable functional areas, business units and facilities. The benefits of this type of

## 2.3 Supply Chain Benchmarking

Table 2.7: Classification of Benchmarking

| Classification                      | Type                   | Meaning  |
|-------------------------------------|------------------------|--|
| <b>Nature of referent other</b>     | Internal               | Comparing within one organization about the performance of similar business units or processes                   |
|                                     | Competitor             | Comparing with direct competitors, catch up or even surpass their overall performance                            |
|                                     | Industry               | Comparing with company in the same industry, including non-competitors   |
|                                     | Generic                | Comparing with an organization which extends beyond industry boundaries  |
|                                     | Global                 | Comparing with an organization where its geographical location extends beyond country boundaries                 |
| <b>Content of benchmark</b>         | Functional             | Application of the process benchmarking that compares particular business functions at two or more organizations |
|                                     | Process                | Pertaining to discrete work processes and operating systems  |
|                                     | Performance            | Concerning outcome characteristics, quantifiable in terms of price, speed, reliability and other measures        |
|                                     | Strategies             | Create knowledge about the strategies other organisations use to implement objectives                            |
|                                     | Competitive advantages | Create knowledge about factors on which the competitive advantages of other organisations are based              |
| <b>Purpose for the relationship</b> | Strategic              | Involving assessment of strategic rather than operational matters  |
|                                     | Competitive            | Comparison for gaining superiority over others   |
|                                     | Collaborative          | Comparison for developing a learning atmosphere and sharing of knowledge   |

Modified from Wah Fong *et al.* (1998) and Prašnikar *et al.* (2005)

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benchmarking is that a set definition of a measurement can be applied to all the areas measured. It is also simpler and more accurate to obtain internal data. For external benchmarking it is more difficult to get hold of applicable data, since your competitors might not be willing to share this. A possible solution is to take part in surveys that are performed by independent third parties such as industry organisations (Cohen & Roussel, 2013).

Prašnikar *et al.* (2005) added two important classifications to the framework that Wah Fong *et al.* (1998) developed. Benchmarking of strategies and competitive advantages is important since it addresses the key components of an organisation. Strategies provide an organisation with goals and objectives. These are required by any organisation that aims to be successful. Benchmarking can be used to evaluate the usefulness of any strategy that is implemented. New business knowledge can be gained by finding the strategies that other organisations use to achieve similar objectives and also eliminate strategies that do not work (Prašnikar *et al.*, 2005).

PWC and the APICS Supply Chain Council (SCC) has worked together to create benchmarks for many industries. As part of the SCOR implementation roadmap, a process used for supply chain performance improvement projects, the APICS SCC included a process of benchmarking.

The literature on benchmarking has decreased in the past few years. Many consulting companies however perform benchmarking studies as a service.

Benchmarking is a tool that is used for performance improvement and developed from the field of performance measurement. Supply chain performance measurement is a complex process due to the integrated nature of supply chain activities. Benchmarking should enable the selection of ideal best practices for processes, organisations, industries and supply chains.



## **2.4 Conclusion**

Supply chain management is increasingly being seen as a strategic function of organisations. The importance of supply chain performance is also increasing due to the opportunities for organisations to distinguish themselves from competitors based on the capabilities of their supply chains. Performance measurement is used as a tool to get feedback on the performance of processes. The complexities of managing a supply chain are caused by the amount of options available.

A supply chain strategy is formulated to define the goals of a group of products. Through segmentation, relevant products are grouped together according to the characteristics that makes most sense. A variety of frameworks exist for selecting a segmentation method and formulating supply chain strategies. The frameworks that were discussed can be applied to a variety of industries. It is important to tailor a supply chain to suit the characteristics of the product and customer. Attention to detail will help to create alignment when formulating a strategy.

Benchmarking is a useful tool for comparing performance and establishing goals. Various types of benchmarking exist and selecting the content and referent that will be compared is important. The performance of competitors are mainly used for benchmarking, but valuable insight can also be gained from comparing the capabilities of departments within the same organisation.

## Chapter 3

# Research Design and Methodology

Research studies are primarily either quantitative or qualitative in nature. When these two methods are combined, it is called methodological triangulation (Welman, 2005). This mixed-method approach was followed to gather the information to develop a performance measurement framework for the South African wine industry that focuses on packaged products sold in the local market.

The chapter consists of two main sections. The methodology in section 3.1 describes the process that was followed to answer the research questions and achieve the research objectives. The multi-phased methodology consists of two phases - a design phase and an implementation phase. The design phase addresses the process of developing a performance measurement framework, which will also be referred to as the ideal framework. The metrics that form part of the ideal framework are seen as the metrics that should be measured. The implementation phase describes how some of these metrics were measured during the project. The result of the implementation phase is the measurements of the metrics. Two rounds of practical measurements were completed as part of implementation.

In section 3.2, the research methods that were used as part of the methodology are explained. Survey questionnaires, interviews and workshops were the primary methods used for collecting information. Each method is explained and motivated according to

the role for which it was used.

Table 3.1 shows the chronological order in which the research methods were applied and indicates the phase(s) where each method played a significant role. The methodology is discussed according to the design and implementation phases and is further categorised according to the steps followed to complete the phase. The same process was used for the design and implementation phases, but each phase focussed on different steps of the process.

Table 3.1: Chronological Order of Research Methods

|   | <b>Research Method</b>  | <b>Purpose</b>                                    | <b>Relevant Phase</b>   |
|---|-------------------------|---|-------------------------|
| 1 | Presentation & Workshop | Introduction and Segmentation                     | Implementation          |
| 2 | Interviews              | Supply Chain Analysis                             | Design                  |
| 3 | Survey Questionnaire    | Data Capturing (Round 1)                          | Implementation          |
| 4 | Workshops               | Feedback to Participants & Industry Segmentation  | Implementation & Design |
| 5 | Interviews              | Overview of Supply Chain Performance Requirements | Design                  |
| 6 | Survey Questionnaire    | Data Capturing (Round 2) Demographic Information  | Implementation & Design |

The order in which the research methods were executed was planned in such a way that the two phases could complement and influence each other by taking place simultaneously. In software design, there are mainly two approaches to development - the waterfall or the agile design method. These approaches are useful to consider for a framework design process. The waterfall method is a sequential method and therefore each step is completed before moving on to the next step. With the agile method, development and feedback take place simultaneously (Mikoluk, 2013). Steps can therefore be returned to more than once. An agile process was followed for the design of the performance measurement framework as well as the implementation process. The initial design of the framework enabled the selection of metrics for the first round of measurements (which was part of the implementation phase). In the same way the

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### 3.1 Research Methodology

practical measurements influenced the design of the framework. It was therefore difficult to discuss the methodology in a chronological order due to the nature of the design.

In addition to the design of a performance measurement framework and the implementation of metrics, the industry was evaluated according to the Supply Chain Roadmap framework. The aim of the evaluation was to identify the most relevant types of supply chains and segmenting methods. Best practices for the local industry could be identified from the results. This framework was discussed in section 2.1.2 and the evaluation of the local industry is presented in section 5.1.

### 3.1 Research Methodology

The Apics Supply Chain Council (SCC) developed a process for performing a benchmarking study that makes use of the SCOR framework. This process and framework formed the backbone of the research and provided structure to the project. The first six steps of the benchmarking process were completed during the the project and the sections below describe how they were used to address the project objectives. Additional methods and resources were also applied during the design phase. This includes segmentation frameworks as well as other performance measurement frameworks that were developed for similar industries. The steps of the benchmarking process are listed below:

1. Supply Chain Definition
2. Supply Chain Prioritisation
3. Supply Chain Strategy
4. Selecting Metrics
5. Sourcing Data
6. Creating a Balanced SCORcard
7. Performing Benchmark

### 3.1 Research Methodology

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Steps one, two and three were combined since they are addressed as one activity in the literature. Supply chain definition, prioritisation and strategy together completes the task of supply chain segmentation. This topic was addressed in the literature review in section 2.1.1. Supply chain segmentation is performed to segment the industry into the various supply chains, in order to create benchmarks that can be compared.

As was mentioned previously, the project consisted of two phases and both phases contributed to results and outcome of the project. The design and implementation phases took place simultaneously, but addressed different objectives. During the design phase a performance measurement framework was developed for the local industry of packaged wine. To develop this framework, steps one to four (supply chain segmentation and selecting metrics) were completed. The implementation phase aimed to evaluate the current performance of the industry and for this purpose steps one to six of the benchmarking process were completed, but the focus was on steps five and six (Sourcing data and creating a Balanced scorecard).

The design of a performance measurement framework is not included for all instances where the benchmarking process is used. Some improvement projects may use the benchmarking process to revise the current selection of measurements (Bolstorff & Rosenbaum, 2012). In this project, the development of a framework for the industry is however a very important part and it is the more important phase of the two.

This project forms part of the first two years of a three year project that will continue in 2016. The implementation process was included to serve as a validation process to receive feedback from the industry and to keep the industry informed of the developments of the project. It introduced the participants to the measurements and also increased the number of participants. The importance of the implementation phase has increased from round one to round two and will continue to be addressed with more detail and verification.

Another important reason for separating the design and implementation phases is the group work and integration that was required during the implementation phase. Data had to be captured simultaneously for all four of the segments. Most cellars participated in at least two of the four segments and did not want to receive separate requests for each segment.

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### 3.1 Research Methodology

#### 3.1.1 Performance Measurement Framework Design Phase

The design process consisted of several evaluations before the final version was compiled. From the beginning it was necessary to distinguish between the ideal design of the framework (selected as part of the design phase) and the measurements that would be measured for implementation (part of implementation phase). The ideal framework would be implemented over a longer period according to the ability of the industry to capture the data as well as the availability of a standardised capturing process and feasible definitions of the metrics.

In order to plan segmentation and select metrics, three aims were identified for the ideal framework. These were derived from the research objectives and formulated according to industry needs and requirements. The aims are as follows:

1. Improving supply chain strategy formulation and execution
2. Enabling decision making
3. Indicating the diagnostic Key Performance Indicators (KPI's)

Theory was used to make the initial design decisions and the framework was then improved, verified and validated through evaluation of the current design. On five occasions, the segmentation method and selection of metrics were evaluated by a panel of academics. The evaluation team changed slightly with each evaluation and consisted of the study leaders and other academics in the field of the wine supply chain. Feedback from international researchers were also received through a conference presentation and visiting professor.

During later stages of the design, interviews with selected industry participants were scheduled to get feedback and further recommendations on specific metrics and definitions. Industry partners included cellars, distributors and retailers in order to incorporate recommendations from decision makers within the source, make and deliver environments. The structure and process of the interviews, workshops and survey questionnaires are discussed in section [3.2](#).

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## 3.1 Research Methodology

### 3.1.1.1 Supply Chain Segmentation

Supply chain segmentation refers to the activity of identifying the supply chains that exist in a company or industry. Segmentation identifies the groups that are used for comparison and therefore it forms the basis of benchmarking and performance measurement.

Through investigations of customers, products, manufacturing processes and inventory policies, a segmentation method could be selected. The investigation was shaped by the segmentation methods found in the literature. Many options for segmentation were considered and discussed during evaluation sessions. From all the possible options, a method could be selected based on the advantages, disadvantages and relevance.

Selecting these segments for the industry was a challenging task to plan and execute. One of the aspects that had to be considered was the feasibility for the industry to perform the prescribed segmentation accurately. This was more relevant for the implementation phases, but the current industry situation should be taken into account for the design of an ideal framework.

There are several trade-offs involved with segmenting. When more segments are selected, the value of the information to the industry is significantly higher, but the effort to provide the information increases. The trade-off therefore lies between the effort to segment and the value of the information received.

### 3.1.1.2 Selecting Metrics

The metrics that were selected for the framework is the outcome of a process of investigation, analysis and evaluation. Bolstorff & Rosenbaum (2012) identified two important guidelines for selecting the metrics when using the SCOR model. Firstly, the overall rule is to have at least one metric from each of the five attributes. Secondly, the organisation should select metrics based on their knowledge and experience of the organisation.

After an investigation of several supply chain frameworks, four frameworks were selected as suitable to select metrics from. The selection criteria included the field

### 3.1 Research Methodology

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of application, scope and year of publication. Two of the frameworks apply to any supply chain, while the other two are developed for specific industries. The criteria and motivation for selecting these four frameworks is explained in more detail in section 6.1. Some of the most relevant frameworks were discussed in section 2.2 of the literature review. It was necessary to consult additional frameworks to ensure the characteristics of the industry are represented well.

Each metric of these four frameworks were considered, but only selected if its relevance in the wine industry could be motivated and validated. Most metrics were selected from the SCOR framework and then adapted according to the more specific frameworks. Adaptations were based on the specific characteristics seen in the wine industry and aimed to increase the relevance of metrics.

#### 3.1.2 Implementation Phase

The implementation phase included the practical work of initial segmentation, collecting the data, creating a scorecard and giving feedback to the industry. In 2014, seventeen cellars agreed to take part in the study after being introduced to and informed about the project. Four additional cellars indicated that they would take part in the project during 2015.

South Africa consists of nine wine regions and cellars from eight of the nine regions were included. In 2014 the 17 cellars together produced 20% of the total volume of packaged wine sold in the local market. In 2015 the additional cellars increased this percentage to 26.4%. The industry was therefore represented well in terms of variety and size.

##### 3.1.2.1 Supply Chain Segmentation

The segmentation method of the SCOR framework was completed with each of the participants of the study to get an overview of the strategies that are present in the industry. Within the SCOR framework, segmentation consists of three activities - supply chain definition, supply chain prioritisation and supply chain strategy. Supply chain definition aims to detect all the customers and products. This is executed by



### 3.1 Research Methodology

constructing a supply chain definition matrix where customers are listed in a column and the products are placed in rows so that it can be identified which customers are served with which products. Figure 3.1 presents an example of how this information is captured. The crosses indicate which products are distributed to which customers within the local packaged market and therefore identifies existing supply chains. Similar supply chains can be grouped to reduce the total number of supply chains. Through prioritisation, the most important supply chains are then identified.

| Supply-Chain Definition Matrix |               |                               | Customer/Market/Channels |                   |                         |                         |
|--------------------------------|---------------|-------------------------------|--------------------------|-------------------|-------------------------|-------------------------|
|                                |               |                               | Retailer                 |                   | Restaurant              |                         |
|                                |               |                               | Delivery to DC           | Delivery to store | Restaurants in region 1 | Restaurants in region 2 |
| Product Groups                 | Bag-in-box    | Private/ Own label            | X                        |                   |                         |                         |
|                                |               | Retailer label                | X                        |                   |                         |                         |
|                                | Glass bottled | Brand 1 (lower price points)  | X                        |                   | X                       |                         |
|                                |               | Brand 2 (higher price points) |                          | X                 | X                       | X                       |

Figure 3.1: Supply Chain Definition Matrix - Example

The segmentation workshops were included as part of the introduction of the project during 2014. Due to the fact that the segmentation step of the design phase had not been completed yet, the standard method was used. The cellars participating in the study were asked to describe their own strategies according to the five attributes of the SCOR model (Responsiveness, reliability, agility, cost and assets). Each attribute was evaluated according to its importance in terms of one of the following: strategic importance, revenue, gross margin percentage, unit volume, number of SKUs.

The outcome of the evaluation is that one attribute is selected for superior performance, two attributes for advantage performance and the other two attributes for parity performance. Superior performance imply that the cellar must be in the top 10% in terms of the metrics measured for this attribute. Advantage performance requires a place within the top 30% and parity means that the cellar must perform at the median level of the industry (50%).

Figure 3.2 indicates how the strategy of a supply chain is defined. The information

### 3.1 Research Methodology

| Supply-Chain Strategy Matrix |                | Bag-in-box private label to DC | Bottled (Brand 2) to Stores | Bottled Private label to all restaurants |
|------------------------------|----------------|--------------------------------|-----------------------------|--|
| External                     | Reliability    | P                              | A                           | S  |
|                              | Responsiveness | A                              | S                           | P  |
|                              | Flexibility    | P                              | A                           | P  |
| Internal                     | Cost           | A                              | P                           | A  |
|                              | Assets         | S                              | P                           | A  |

P – Parity, A – Advantage, S - Superior

Figure 3.2: SCOR Supply Chain Strategy Matrix

from Figure 3.1 is used in Figure 3.2. It can be seen that the three supply chains focus on different attributes. Superior performance (S) in terms of assets is required for bag-in-box products distributed to retailers' distribution centres, while the main focus for the other two supply chains are responsiveness and reliability.

The initial prioritisation of supply chains for the purpose of this project was selected according to the volume a cellar sold in each segment in 2014. The two segments with the largest volumes were therefore selected, except if the cellar preferred another method (than volume). Seven of the cellars focused on the packaged local segment.

The metrics implemented for the first round of measurements were selected according to the method prescribed by Bolstorff & Rosenbaum (2012), which states that at least one metric from each attribute should be included. Metrics were added or removed for the second round based on the feedback of the first round of measurements.

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## 3.2 Research Methods

### 3.1.2.2 Sourcing Data and Creating a Balanced SCORcard

The first round of measurement took place during August and September of 2014. Six measurements were selected and the data was captured separately for each segment. At that stage sixteen cellars took part in the study and most cellars provided information for two of the segments. Data was captured by means of excel spreadsheets. Definitions from the SCOR framework were used for the metrics and no further segmentation (except for the four segments of the project) were required from the cellars.

Feedback was provided to the industry through workshop sessions held in November 2014. The results of the first round of measurements were presented to participants and discussions on the segmentation, metrics and challenges were discussed.

During April and May 2015 the second round of data capturing took place. It was important to improve the capturing process from round one to two. More attention was given to the definitions of the metrics to provide a clear understanding of how to calculate measurements. Data was captured by means of an online survey tool during the second round of measurements. The content and process of the survey is discussed in section [3.2.2](#).

## 3.2 Research Methods

This project regarded the collection of both qualitative and quantitative data and information. The research methods used for data collection include:

- Survey questionnaires
- Interviews
- Workshop sessions

Making use of three different research methods provided room for a detailed and in-depth investigation of the problem. The motivation for selecting these methods as well as their application during the project will be discussed below.

## 3.2 Research Methods

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### 3.2.1 Interviews

Throughout the project several semi-structured and unstructured interviews were conducted. The purpose of the interviews were mainly aimed at completing the design phase. Most interviews were semi-structured and took place between one or two students and representatives of the wine cellars. Specific questions were included on the interview schedule, but other issues could also be discussed. The meetings were mostly scheduled to exchange new information, provide feedback on previous meetings, discuss the progress or schedule of the project and communicate coming requirements from either side. Through a close-working relationship with each cellar, relevant issues could be identified and different scenarios were considered.

An interview can be defined as any person-to-person interaction that has a specific purpose (Kumar, 2005). It is seen as one of the best methods to capture qualitative information. It creates opportunities for the researcher to listen to the views and experiences of the interviewee and only ask relevant questions (Harding, 2013). Other advantages are that questions could be clarified if they are not understood the first time and the conversation can lead to other relevant topics that may not have been part of the agenda. Interviews are seen as the most appropriate approach for studying complex and sensitive areas (Kumar, 2005).

Interviews were selected for most of the qualitative data capturing from cellars since respondents required background on the research and project. Sensitive information was required from cellars that participated in the study and therefore less personal methods would not have been sufficient on its own. The disadvantages of interviews were the time and costs involved in conducting the interviews. The time spent in interviews were however meaningful and provided background information on the industry.

Interviews with distributors and retailers were more structured and usually only occurred once. The aim of these interviews was to get an overview of the:

- Scope of services offered
- Requirements of cellars
- Requirements from their customers

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## 3.2 Research Methods

- Performance metrics measured

The list of questions for the interviews can be seen in Appendix C, while an overview of the answers is discussed in section 1.3.3.

### 3.2.2 Survey Questionnaires

The main objective for using survey questionnaires was to capture data for the two rounds of measurements that formed part of the implementation phase. To collect data about the current performance of the wine cellars, excel spreadsheets as well as an online survey tool were used. The first set of data was collected with the aid of excel spreadsheets during August and September 2014. Tableau software was used to analyse, represent and summarise the data. It was important to consider the confidentiality of information in this process due to the type of information received.

For the second round of measurements an online survey tool was used. The questions included in this questionnaire can be seen in Appendix C. Advantages that are relevant to this project include time savings and convenience of data capturing and analysis. Disadvantages of questionnaires include low response rates, limited opportunity for clarification and limited answers (Kumar, 2005).

Since the survey was sent to a selected group of participants, the response rate was expected to be high. Participants knew that they would be asked to provide information for the project and using a survey also eased the process for the cellars. The allowed time for completion was not limited to ensure that respondents could ask questions when they were unsure. Where respondents' answers did not make sense, they were asked to clarify answers. Most answers provided room for additional comments or explanations.

The survey consisted of two sections. The first section contained general questions that applied to all cellars. The second section of the survey contained four subsections that included questions relating to three of the four segments (packaged local, packaged export and bulk export) as well as a section for all packaged products. The questions regarding each segment were grouped together in a subsection so that cellars could only complete the relevant sections.

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## 3.2 Research Methods

While the general questions captured demographic information of the cellar, the segmented questions captured both measurements and demographic information. The packaged local section of the survey included questions on the type of relationship between the cellar and its customers in order to validate the selection of customers used for segmentation.

Important demographic information of the participating cellars was captured through the online survey. Demographic information enables comparisons of relevant cellars based on their characteristics. In the future, demographic information could be used for segmentation. Of the 22 cellars to which the survey was sent, 18 responses were received. Thirteen cellars completed the section for the packaged local industry.

### 3.2.3 Workshop Sessions

The feedback sessions conducted at the end of 2014 had characteristics of workshops and focus groups. A workshop is a structured session where consensus can be reached about a certain topic through interaction and discussion. It consists of a group of approximately 6 - 15 people and it is an appropriate method for understanding and evaluating matters (UCL, 2013). Focus groups or workshops are different from interviews since they are conducted between a group of people that all aim to take part in the discussion. The researcher or facilitator has less control over the discussion, but fewer interpretation is required since participants can provide insight as the conversation develops (Harding, 2013).

Mediation is an important part of a workshop to avoid that a certain topic or person take control of a session. Both workshops and focus groups should however be seen as an open-ended process and will not deliver as exact answers as a structured interview (UCL, 2013).

Three similar workshops were organised at the end of 2014 to discuss the project. These discussions were attended by representatives from the 16 wine cellars, academics, industry partners involved in the project as well as representatives of the sponsors (Vin-Pro and Winetech). The objective of the workshops was to give feedback of the year, discuss the segmentation of the industry, and talk about the usefulness of performance

### 3.2 Research Methods

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metrics. In total 25 people attended the three sessions. The discussions created opportunity for wine cellars to think about the necessity and benefit of the project for their own cellar and the industry.

All three sessions were limited to a duration of two hours. By arranging three workshops, the groups were smaller and manageable. The total number of attendees was also increased by organising three sessions since the sessions were scheduled for different days and locations. Any of the three sessions could be attended.

The introductory presentations included some characteristics of focus groups and workshops but the focus was on introducing the project through a presentation. The segmentation exercise required cellars to take part in the session by describing the strategy of the cellar. The groups were however smaller than six and was facilitated by a member of the steering committee.

### **3.3 Conclusion**

The research design discussed in this chapter describes a multi-phased methodology where mixed methods were used to gather information. The two phases of the project (design and implementation phase) were completed simultaneously to answer the central research question.

Through the application of selected research methods, both qualitative and quantitative data was gathered. Survey questionnaires, interviews and workshops were used continuously during the project and contributed to both phases. The chronological order in which the methods were planned and completed enabled that the research objectives could be answered through an agile process. This meant that feedback of completed activities could be used for further development of the project.

Resources from the Apics Supply Chain Council were used for identifying and capturing the necessary information. The SCOR framework as well as the benchmarking process formed an important part of the project.



## Chapter 4

# Results

In chapter 3, the process of information gathering was described. Various research methods were used to gather information that will be presented in this chapter to describe the industry supply chain environment. Knowing the drivers of the industry can lead to a process of improvement through performance measurement. The aim of this chapter is therefore to present an overview of the current supply chain strategies, characteristics and performance measurement.

The current strategies of participating cellars is presented in section 4.1. Cellars indicated what they focus on by prioritising performance attributes. It was also necessary to identify the characteristics of the industry and motivate why they should be considered in the process of decision-making and performance measurement. In section 4.3, the outcome of the practical measurements of the project is discussed and some challenges are highlighted. Where participants are mentioned, the participating cellars of the study are referred to. These are the 23 cellars that took part in the study (17 cellars took part since 2014 and another 6 were included in 2015).

### 4.1 Current Strategies of the Industry

Seven participants (focussing on the local market) were asked to select the attributes that were seen as having superior, advantage and parity performance to their local supply chain. Table 4.1 indicates the number of responses towards each category.

#### 4.1 Current Strategies of the Industry

Two attributes could be selected for parity and advantage performance, but only one attribute for superior performance. The attribute selected for superior performance defines the core aim of a cellar's strategy.

Table 4.1: Evaluation of Attribute Importance

|  | Superior | Advantage | Parity |
|--|----------|-----------|--------|
| <b>Reliability</b>   | 2        | 4         | 1      |
| <b>Responsiveness</b>  | 1        | 4         | 2      |
| <b>Flexibility</b>   | 0        | 2         | 5      |
| <b>Cost</b>  | 3        | 2         | 2      |
| <b>Assets</b>  | 1        | 2         | 4      |
| <b>Number of wine cellars participating in local package segment</b> | 7        |           |        |

Three of the seven cellars indicated that they aim to perform at a superior level in terms of cost in the local market. Reliability and responsiveness were mostly selected for advantage performance and flexibility and assets were mostly valued at parity level. The two numbers that stand out is the parity evaluation for flexibility (5 out of 7 cellars) and the superior evaluation of cost (indicated in squares in Table 4.1). None of the cellars indicated that flexibility requires superior performance. This means that cellars do not aim to distinguish themselves from competitors based on their ability to be flexible. Since only one attribute can be selected for superior performance, it is also significant that cost was selected by three cellars.

For this exercise, all packaged products in the local market were seen as being part of one supply chain - no further product or customer segmentation was required. There is a strong focus on reliability and responsiveness (customer facing metrics), but also on cost (internal facing metric). The combination of reliability and responsiveness went together for all of the respondents. This means that none of the respondents evaluated one of the two attributes as parity and the other as superior. Three cellars selected a superior - advantage combination, another three indicated a parity - advantage relationship and one cellar evaluated both as advantage. Cost was however not associated with a specific attribute. In general no other combinations of attributed can be seen from the evaluation.

## 4.2 Industry Characteristics

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These results indicate that there are cellars within the local wine industry that focus on keeping costs low, while there are others that aim to act reliable and responsive towards customers. These two types of cellars should not compare performance since they have different strategies.

## 4.2 Industry Characteristics

Understanding the local wine supply chain required a clear picture of the industry drivers. Characteristics of the industry were identified to establish how performance measurement should be approached to achieve supply chain goals. Information received from all of the research methods contributed to the identification of the characteristics. This includes survey data, practical measurements, interviews and focus group discussions. The information is structured according to the sourcing, production and delivery processes.

Figure 4.1 presents the flow of the main activities of the the South African wine supply chain. Distributors, retailers and restaurants are seen as the major customers of cellars. Arrows indicate product flow, while the blocks represent the role players. The diagram indicates the product flows within the local industry as well as the two export segments of the industry (bulk export and packaged export). This demonstrates how the activities of the various segments are related. When sourcing activities are measured, it did for instance not make sense to keep export and local activities separate, since the operations are integrated. All types of customers were consulted to be able to incorporate customer requirements and expectations.

Characteristics of the sourcing and production environments is mostly supported with data from the survey, while interviews with distributors contributed to the discussion on distribution. Additional characteristics of direct customers (restaurants, retailers and distributors) as well as consumers are also mentioned.

The relevance of the characteristics can be seen in the decisions that it influences. Performance measurement was selected as the approach to performance improvement in this project. Level 1 decisions are strategic decisions that will require information from various metrics and sources. These decisions are long term and together they define

4.2 Industry Characteristics

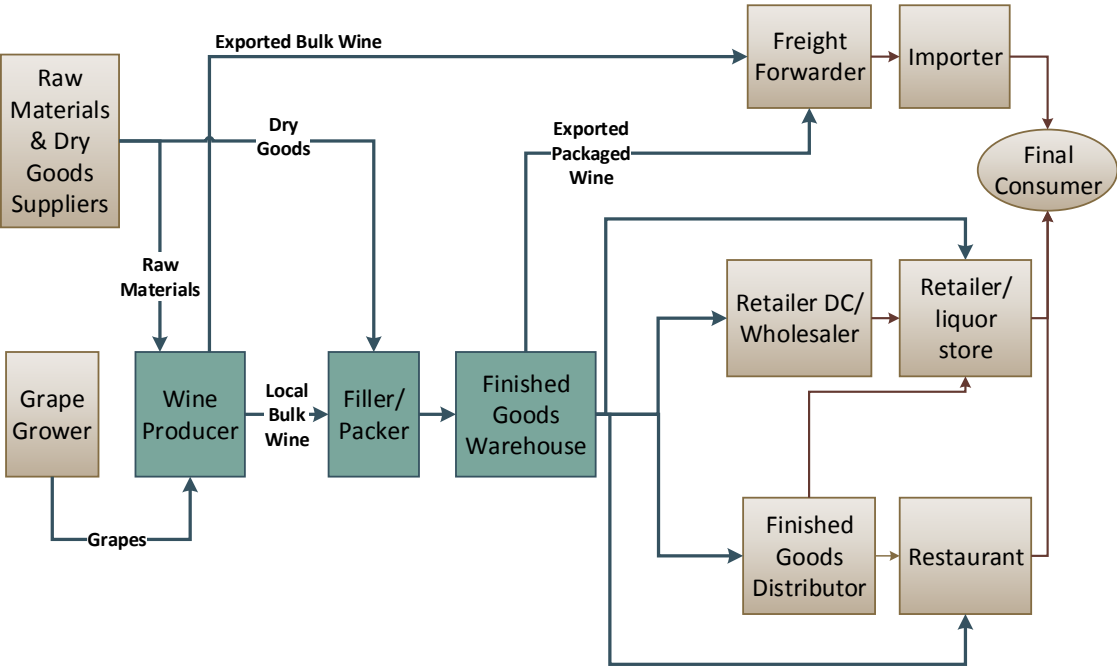


Figure 4.1: Wine Supply Chain of South Africa

the goals of an organisation. The level 2 decisions are revised more often and does not change the direction of the organisation. The root cause of a problem is investigated by measuring level 2 and also other more detailed metrics.

4.2.1 Sourcing Characteristics

Sourcing activities include harvesting grapes, buying dry goods and then managing suppliers and inventory. The sourcing environment of the wine industry is a complex environment due to the uncertainty that is involved. While some uncertainty can be reduced through management practices, the supply of all agricultural processes are vulnerable due to annual weather patterns (Aramyan, 2007).

Uncertain supply factors include grape quantity, grape quality, day of harvest and

## 4.2 Industry Characteristics

dry goods lead times. The lead times of five types of dry goods materials are shown below. Figure 4.2 shows the average number of days that each of the participants indicated as the time it takes for an order to be delivered. Each cellar is represented by a specific colour.

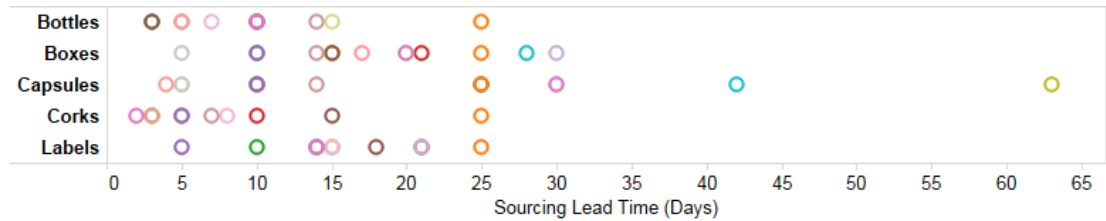


Figure 4.2: Sourcing Lead Time of various Dry Goods

Most materials take between 2 to 21 days to be delivered. Many cellars indicated that the lead time can vary a lot from order to order. The lead time also depends on whether standard or branded materials are ordered. No values were removed from the data. Data points that seemed like outliers were questioned and confirmed to be correct. Capsules have a very long lead time and take up to 63 days and they are often branded.

Apart from the variation in lead times, the duration is also a concern since many products take more than 10 days to arrive. When sourcing lead times are long, safety stock has to be increased, impacting inventory levels in a negative way. This will in turn cause repercussions for the rest of the supply chain. By measuring and improving the reliability and responsiveness of suppliers, complexity can be reduced.

The important decisions that were identified from the sourcing environment are shown in 4.2. Some of the decisions relate to inventory management, which will be discussed further in the production environment section (section 4.2.2).

The decision to use branded or standard dry goods is included since most cellars attributed the variation in lead time to whether the order included standard material or branded material. When making use of branded material, the sourcing lead time can increase to twice the normal time.

## 4.2 Industry Characteristics

Table 4.2: Important Decisions in the Sourcing Environment

|   |
|---|
| <b>Level 1</b>  |
| Number of suppliers for grapes                                  |
| Number of suppliers for dry goods                               |
| Selecting suppliers for dry goods                               |
| <b>Level 2</b>  |
| Using branded or standard dry goods                             |
| Buying in of additional wine (type of wine, quantity, supplier) |
| Inventory level of dry goods                                    |
| Safety stock for dry goods                                      |

### 4.2.2 Production Characteristics

All materials must be sourced before products can be classified as finished goods. The production process consists of two important sections - winemaking and packaging. Postponing some of the packaging steps can be beneficial but it creates a strong dependency between the sourcing of dry goods, packaging and distribution.

The characteristics of the production environment relate mainly to inventory management and packaging. The wine industry is very cash flow sensitive due to a long production process where financial investments are required. Even after the wine is sold, debtors take up to 90 days to make payments. Inventory levels of dry goods and finished goods were considered since participants highlighted that both of these have an impact on cash flow and availability of finished goods.

Having finished goods available reduces risk of being unable to respond within the required time, especially when packaging operations are not flexible. It was observed that most cellars use a make-to-stock (MTS) strategy, which means that orders are delivered from finished goods inventory and therefore all products are packaged in advance and stored until delivery takes place. To investigate the use of a Make-to-stock (MTS) inventory model, cellars were asked to provide the percentage of orders for which all the required products came from a stock buffer (this meant that no bottling, labelling or rework had to be done). This percentage is referred to as the MTS percentage of a cellar. From Figure 4.3 it is seen that all participants keep some

## 4.2 Industry Characteristics

finished goods, and ten of the thirteen cellars have a MTS percentage of 50% or more (each bar on the graph represents a cellar).

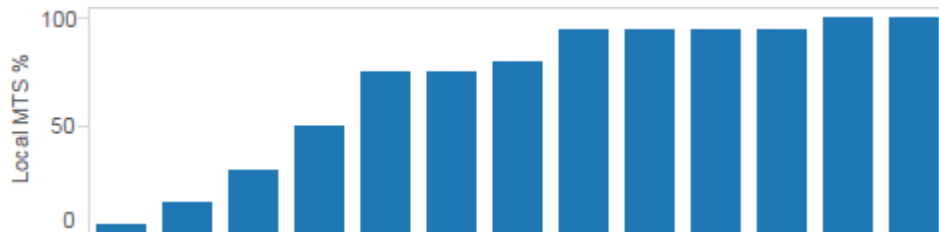


Figure 4.3: MTS % of 13 Participating Cellars

The major reasons for keeping finished goods inventory is to avoid lost sales and to increase the utilisation of packaging machines. Some cellars do not own packaging facilities and use outsourced services. In this case larger batches are usually packaged at a time to reduce cost. The influence of a Make-to-stock (MTS) inventory model on inventory is indicated by viewing the inventory days of supply (IDOS) as well as the dry goods inventory levels of cellars in relation to their MTS%.

Dry goods inventory is expressed as a R/L value and it is calculated by dividing the total inventory value of raw materials by the volumes sold per month. This relative value of the investment made towards dry goods can be compared across all cellars, irrelevant of the size of the cellar. It is thus not used to measure how expensive the individual materials are, but rather to represent the value of raw materials that is stored (per liter sold). A value measure was selected so that the financial impact is taken into account. In many instances the storage space for raw materials is not the concern, but rather the impact on cash-flow.

Figure 4.4 indicates the MTS %, finished goods IDOS and the value of dry goods inventory of five cellars. Cellars that decided to deliver orders from finished goods (high MTS%) also keep more days' inventory. This result was expected, but what can be noted is that these cellars are able to invest less in dry goods. Three cellars indicated a MTS% of 95% and these cellars keep between 31 and 40 days' finished goods inventory. The remaining two cellars indicated a MTS% of 5% and 15% respectively and kept less than 14 days' inventory. Cellars that decided to postpone packaging store more than R3.70 of dry goods per liter sold, while others were able to reduce this value to below R1.90/l. It is also indicated on the left whether the cellar owns packaging facilities.

## 4.2 Industry Characteristics

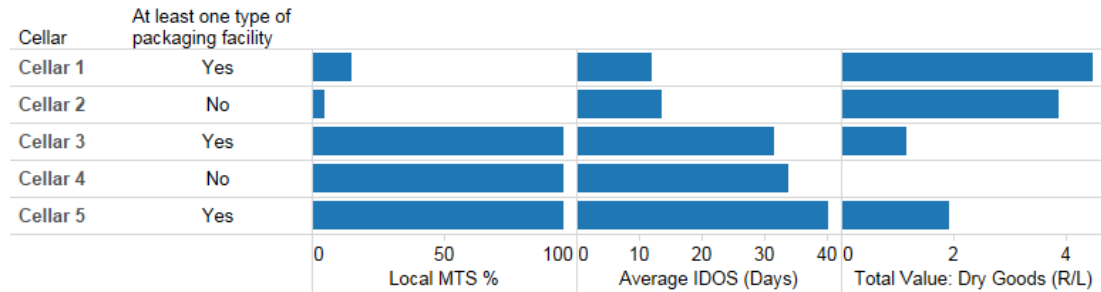


Figure 4.4: The relationship between MTS percentage, IDOS and dry goods inventory

The decision to use a MTS strategy for inventory therefore influences both finished goods and dry goods inventory. In terms of other characteristics (size, location, packaging facilities) these five cellars represent a variety of combinations. The tendency is therefore not limited to a certain type of cellar.

This relationship should be studied further to evaluate the impact of reducing dry goods inventory. It was seen that one of the cellars managed to keep no inventory of dry goods. This is however enabled by outsourcing all packaging operations and 90% of storage requirements, which may have cost and flexibility implications. Whether the cellars own packaging facilities were included in Figure 4.4 to illustrate that reducing inventory of dry goods is not dependant on packaging facilities. Apart from this, it also shows the variety of configurations in terms of supply chain design.

Outsourcing is another common practice in the wine industry, especially for smaller cellars. Figure 4.5 indicates the percentage of storage, labelling, bottling and bag-in-box packaging that is outsourced by each of the participants. The values represent the packaged local and export operations and where no value is indicated, the cellar does not perform the activity (only applicable to bottling and bag-in-box packaging).



## 4.2 Industry Characteristics

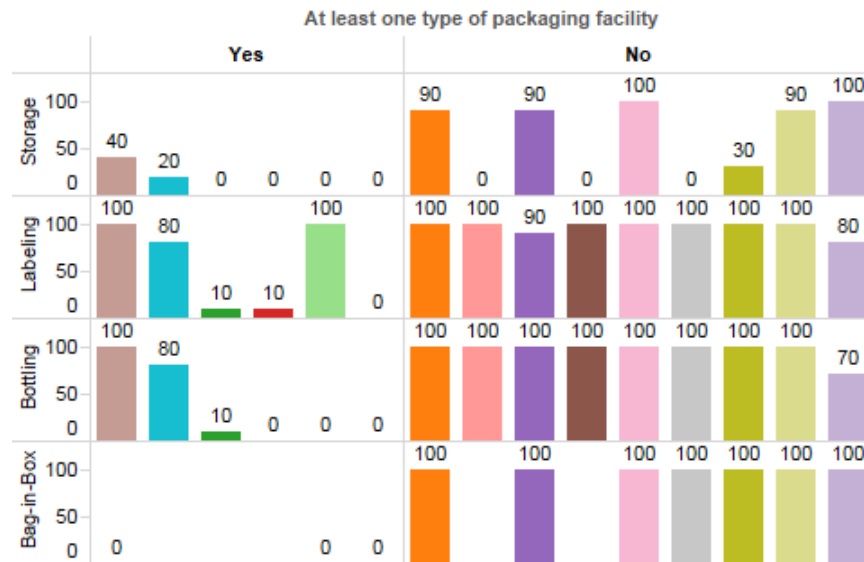


Figure 4.5: Services Outsourced (% of Total)

At the top of the graph it is shown whether the cellar owns a packaging facility or not (only one type of facility was required to qualify). Some cellars outsource packaging services even when they own the necessary facilities. Storage is usually not outsourced when a cellar performs the packaging themselves.

Table 4.3 summarises the critical decisions of the production environment. Decisions relating to dry goods inventory were already mentioned as part of sourcing decisions.

The activities of the sourcing and production environments are closely related and decisions should not be made in isolation. The decisions are complex due to the variety of options and the close relationship to the strategy of the supply chain. Depending on the strategy, different approaches will be followed. Making these decisions with a comprehensive set of information from multiple attributes could improve performance.

### 4.2.3 Distribution Characteristics

Distribution is a very important part of the wine supply chain. The following overview could be provided from interviews with seven distributors, one retailer and relevant participating cellars. Order processing, receiving, transportation and route planning

## 4.2 Industry Characteristics

Table 4.3: Important Decisions in the Production Environment

|  |
|--|
| <b>Level 1</b>   |
| Inventory strategy (MTS, Make-to-order or other)           |
| Packaging facilities to implement                          |
| <b>Level 2</b>   |
| Asset utilization and spare capacity on packaging machines |
| Batch size of packaging runs                               |
| Finished goods inventory level                             |
| Outsourcing of packaging and storage                       |
| Location of finished goods storage                         |
| Scheduling packaging operations                            |

are some distribution and warehousing activities that cellars may consider to outsource. Many cellars prefer to do marketing functions internally and only outsource warehousing.

In general there is a variety of distributors available in terms of size and services offered. Several cellars however mentioned that there is room for more and specialized services. Developing long term relationships with customers provides security, but also creates dependence. According to Ewert *et al.* (2014), it takes time to develop sales channels and establish markets.

Distributors focus on optimal inventory management through forecasting and demand planning. Information systems play a very important role in distribution and enables most of the important functions of a distributor and retailer. Big investments are made to implement a system with the right capabilities. Cellars make use of information systems to manage inventory but capabilities are often limited or has to be customised for the cellar. Real time information of inventory levels and orders help with decision making in the distribution environment.

Visibility into sales further down the supply chain (closer to the consumer) is valuable since it can provide information to predict coming orders and therefore improve inventory management. Reorder points, inventory levels, demand and sales forecasts would be calculated for every product individually and attention to detail is very important. From discussions, distributors seem to focus on this since it is their core business.

## 4.2 Industry Characteristics

Cellars perform a larger scope of activities and therefore do not focus on distribution only.

Some distributors focus on product segmentation, while others segment their customers. Where customer segmentation is performed, specific products are developed for the customer. Customisation of products creates complexities in a supply chain. When a customer requires customisation, the cellar will be closely involved to develop the product. It was seen more than once that retailers partner with cellars to develop a specific product. In the survey four cellars indicated that they develop products in partnership with retailers. Only one cellar partnered with a restaurant and distributor to jointly develop products.

The use of outsourced transportation to local customers is common among participants and it is mostly in the case of restaurants that cellars consider to deliver their own products (see Figure 4.6). Participants answered this question for each local customer that they sell to, and therefore the total number of answers per customer type differs slightly.

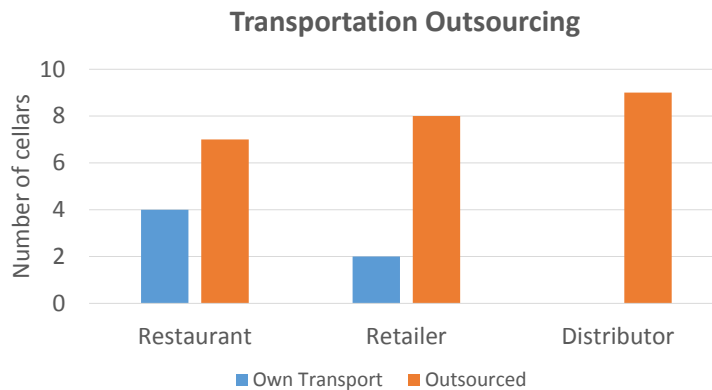


Figure 4.6: Outsourcing of Transportation to various Customers

Cellars are looking for ways to create synergies to achieve economies of scale, particularly in the distribution environment (Retief, 2015). Using a distributor can help in this regard and also assist with national deliveries to reach all regions. Retailers and restaurants can benefit from distributors when they prefer service providers that

## 4.2 Industry Characteristics

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can provide them with a variety of products. This simplifies ordering and receiving significantly.

The retail market is not an easy route to market, but has several advantages. It is a sophisticated and demanding market with limited financial rewards, but has also stimulated innovation, systematic quality management and better managerial practices (Ewert *et al.*, 2014). In order to sell wine to a retailer, the wine must be listed by the retailer. Listings are reviewed on an annual basis.

Retailers can quite easily substitute products and therefore it is critical to have the correct inventory when an order is placed. This is due to the importance of on shelf availability for the final consumer. It is challenging and high-risk to postpone packaging until a customer places an order. Postponement could however still be applied when organisations are agile, flexible and responsive.

Demand variation from retailers are relatively predictable over a period of time, but the timing and volume of the order is not predictable. This might lead to an out-of stock scenario, which is undesirable seeing that retailers can quite easily substitute products (Cruywagen, 2015). Annual cycles are complex to predict and festive times such as Christmas and Easter are especially challenging.

Restaurants order smaller quantities at a time since they generally lack storage space. Depending on the total volume of restaurant orders, the smaller and irregular quantities may be a problem in terms of inventory availability (Brits, 2015). Restaurant sales is a small part of all participants' sales (only 8% of total local sales of participants) and therefore it was difficult to establish the influence of restaurant orders on inventory levels. The total on-trade sales of the industry is 30.2% (MarketLine, 2014) and cellars that focus on restaurant sales may have to focus on being flexible with their packaging and distribution processes.

When we consider how cellars evaluated customer demand variation in the survey, medium demand variation is mostly experienced (see Figure 4.7).

Most cellars perceive demand variation to be medium. Some cellars perceive their customers to all have the same type of demand variation, while others indicated that restaurants, retailers and distributors act different. Through further investigation it

4.2 Industry Characteristics

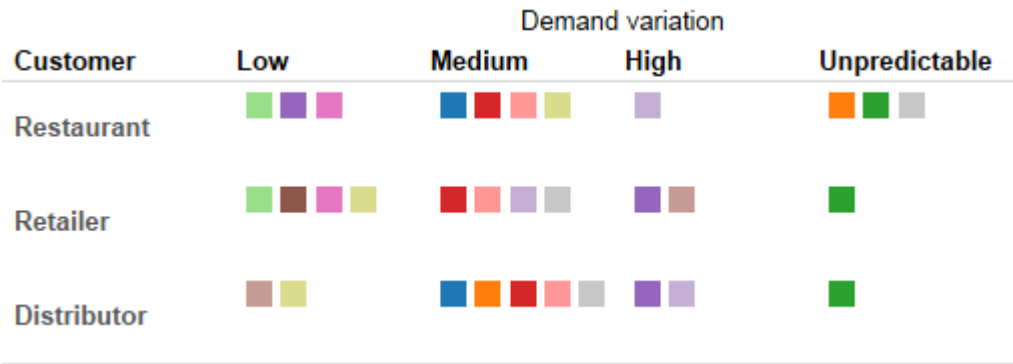


Figure 4.7: Customer demand variation as experienced by 13 participants

was seen that all the cellars that indicated their customers to have the same type of demand variation are smaller cellars that sell less than 650 000 litres in the local market. It can therefore be deduced that smaller cellars do not perceive a significant difference between customer types.

Investigating the distribution environment identified some practices regarding transportation, customisation, demand variation, customer requirements visibility and technology capabilities. All of the options poses the industry with decisions.

The important decisions of the distribution environment are shown in Table 4.4. The distribution environment provides many possibilities and there is no standard route or channel.

Table 4.4: Important Decisions in the Distribution Environment

|   |
|---|
| <b>Level 1</b>  |
| Decision to outsource distribution or not               |
| Selecting own transportation resources                  |
| Selecting locations distributed to (National footprint) |
| Decision to offer customisation of orders or products   |
| <b>Level 2</b>  |
| Delivery routing of own distribution                    |
| Scheduling deliveries                                   |
| Minimum order quantity policy (or other policies)       |
| Selecting partner(s) for transportation service         |

## 4.2 Industry Characteristics

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Depending on the level 1 decision to outsource distribution or transportation, some level 2 decisions may not be relevant. Other level two decisions relate to scheduling, routing and policies. Only a minimum order policy is mentioned, but others may be necessary. An understanding of the environment enabled the recognition of decisions as well as opportunities for further investigation. Best practices can be identified in combination with performance measurement.

### 4.2.4 South African Consumers

Only 39% of the total production of South Africa is consumed within the country. South Africa is not currently considered as a wine drinking country since consumption is only 7.3 litres per capita (Foxcroft, 2009) (SAWIS, 2015). The average consumption of the top ten wine consuming countries was 45.66 litres per capita in 2014. Some of the countries included in the top ten are France, Slovenia, Croatia, Portugal and Switzerland (Kiersz, 2014).

Selecting a bottle of wine is a complex decision to most consumers. There are many products to choose from and some consumers do not necessarily understand the difference between products. It is therefore important for producers to distinguish their products from the other choices available to the consumer (Engelbrecht *et al.*, 2014). Product differentiation can be achieved with wine by displaying awards, accreditations for fairtrade and biodiversity initiatives. Wine producers have also established wine routes to help consumers recognise their wines in a store (Engelbrecht *et al.*, 2014). Several intrinsic and extrinsic cues are available on the product. Intrinsic cues provides information about the physical part of the product. This includes grape variety, alcohol content and type of wine. Extrinsic cues are any aspects only associated with the product, such as price, packaging, labelling, product brand name and the region of production (Engelbrecht *et al.*, 2014) (Veale, 2008).

Engelbrecht *et al.* (2014) studied the relevance of the region-of-origin (ROO) of wines to consumers. The aim was to determine whether the ROO is one of the extrinsic cues on the wine label that influences the consumer's wine purchase decision. Through an empirical study on 434 South African wine consumers, the authors determined that the level of involvement is the only characteristic that impacts the wine purchase

### 4.3 Project Metrics

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decision of South African consumers significantly. High-involved consumers are also more inclined to use complex information cues and spend more per bottle (Engelbrecht *et al.*, 2014). The conclusion therefore is that the ROO is one of the secondary factors to consumers when they select wine, but involved consumers will use ROO as well as other forms of information to make a decision. Product knowledge was found to be another main indicator of product involvement Hussain *et al.* (2007)

### 4.3 Project Metrics

The measurements captured during the project contributed to the development of the performance measurement framework by identifying metrics that will enable decision making within the industry. The process of measurement as well as the results opened opportunities for improvement.

Data was collected from the participating cellars during two separate measurement rounds. The first round of metrics focussed on providing an overview of cellars' strategies and identify metrics that could be used for future industry benchmarks. In the second round, inventory management was investigated further. The larger project that was initiated to investigate performance measurement within the South African wine supply chain is a three year project that that will continue into 2016. The aim of implementing metrics during the first two years of the project (which focused on the design of the framework), was to get an overview of the possibilities and challenges within the industry in terms of performance measurement and data availability.

In the future a benchmark for each of the metrics should be calculated so that performance can be compared. This was not yet possible since the information received from industry is insufficient. Some data is not available since it is not captured. Other data is not standardised or flexible and therefore it cannot be used. It was expected that some of the metrics may be unfamiliar to participants and therefore clear definitions were provided for the metrics. Challenges still occurred during the process and they were mostly experienced when the metric definitions had to be applied to the cellar's unique operations. The specific challenges of each metric is also mentioned as part of the outcome.

### 4.3 Project Metrics

Table 4.5 provides a list of all the metrics that formed part of the project and during which measurement round they were investigated. The evaluation of the current availability of data currently is also indicated. If the data could be received from most participants, it was seen to be available (yes). Partially available was indicated if most cellars could not provide the data and mistakes occurred. Only metrics for which the data were not received from any participants were seen to unavailable (No). An overview of all the metrics can be seen in Appendix B.

Table 4.5: Project Metrics and Availability of Data

| Metrics                                   | Measured |         | Information Availability |         |    |
|---|----------|---------|--------------------------|---------|----|
|   | Round 1  | Round 2 | Yes                      | Partial | No |
| Reliability                               |          |         |                          |         |    |
| Perfect order fulfilment                  | 1        | 1       | 1                        |         |    |
| % of Orders delivered in full             | 1        | 1       |                          | 1       |    |
| Responsiveness                            |          |         |                          |         |    |
| Order fulfillment cycle time              | 1        | 1       |                          | 1       |    |
| Internal order cycle time                 | 1        | 1       |                          | 1       |    |
| Source cycle time                         |          | 1       |                          | 1       |    |
| Agility                                   |          |         |                          |         |    |
| Downside deliver adaptability             | 1        |         |                          |         | 1  |
| Upside deliver adaptability               | 1        |         |                          |         | 1  |
| Cost                                      |          |         |                          |         |    |
| Transportation cost                       | 1        |         |                          | 1       |    |
| Assets                                    |          |         |                          |         |    |
| Inventory days of supply - Finished goods | 1        | 1       | 1                        |         |    |
| Inventory days of supply - Dry goods      |          | 1       |                          | 1       |    |
| Creditors days                            |          | 1       |                          | 1       |    |
| Debtors days                              |          | 1       |                          | 1       |    |

The data set was small and easy to work with, but outliers could easily affect an average. Outliers were removed from the data by means of logical reasoning rather than a calculated formula. An example of a data point that was removed include the IDOS of a small cellar, that kept more than a year's inventory. This practice made



### 4.3 Project Metrics

sense to the specific cellar since the total amount of inventory could be stored. It is however not representative of the industry and would influence the data. Before any values were excluded, the data used for the calculation was reviewed by the cellar to ensure it is accurate.

Table 4.6 indicates the results of the measured values for six metrics from the first round. The average for all segments includes the four segments of the industry (packaged local, packaged export, bulk local and bulk export).

Table 4.6: Measurement Results Round 1

| <b>Round 1<br/>Measurement</b> | <b>Unit</b> | <b>All Segments</b> | <b>Packaged Local</b> |
|--------------------------------|-------------|---------------------|-----------------------|
| Inventory Days of Supply       | Days        | 205.64              | 42.85                 |
| Order Fulfilment Cycle Time    | Days        | 12.13               | 3                     |
| Perfect Order Fulfilment       | %           | 93                  | 94                    |
| Storage Cost                   | R/l         | 0.046               | 0.044                 |
| Transportation Cost            | R/l         | 0.36                | 0.95                  |
| Upside SC Flexibility          | Days        | 20.53               | 16.25                 |

The difference between the averages for inventory days of supply can be attributed to the fact that bulk wine is often stored for more than a year, while packaging will only take place closer to the selling date, seeing that packaged products take up more space and the risk of damage is higher.

Order fulfilment cycle time measures the total time for an order and was measured in days. Orders for packaged products take longer than bulk wine and cycle times for exported orders also take longer than local orders in general. The measurement however only included the time until the wine reached the South African harbour for exports. The segment where orders took the longest was the packaged export segment.

Perfect order fulfilment is the percentage of orders meeting delivery performance with complete and accurate documentation and no delivery damage. It was challenging to implement a standard definition since the organisations within the industry approach the ordering placement process differently. Order cycle time, order reliability and inventory days of supply can be seen as standard metrics in the distribution environment. For the purpose of warehouse management, many operational metrics are

### 4.3 Project Metrics

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also measured. The order fulfilment rate is a common metric for distributors, but it is measured differently by the various distributors. Retailers on the other hand impose strict requirements in terms of order cycle times and order fulfilment rates.

During the second round of measurements, distributors were asked for data on reliability (order fulfilment) and responsiveness (order cycle time) of the cellars delivering to them. This would have enlarged the representation of the sample and simplify the capturing process, since information would be received from one partner. It was also expected that more accurate and standardised data would be obtained when approached in this manner.

It was however found that although the order cycle time and order fulfilment rate could be calculated from data that distributors capture, the data was not available in an accessible format. The exact cycle time could be calculated from data captured within the information system, but it does not appear on any report. It would therefore take too long to extract this information for many cellars and orders. Order fulfilment rates were also not measured in such a way that it could be compared. Some organisations only places an order when it has been confirmed that the inventory is available, while other distributors do not measure fulfilment rates. The relevant results of second measurement round is therefore not displayed here, but discussed in section 4.2.

Deliveries to distributors are however mostly standardised - this means that a cellar would deliver once or twice a week on standardised times. It seems that the motivation to measure and report on these metrics does not yet exist since it is believed that the problems are minimal. The estimated cycle times for various distributors were between 3 days and two weeks on average.

Other metrics that were measured during the second round include supply lead time and inventory days of supply (dry goods and finished goods). The trends regarding these values were discussed in section 4.2. Inventory levels of cellars vary from cellar to cellar and the average IDOS is 65 days. Throughout the year inventory levels are relatively stable for cellars that own packaging facilities. When packaging is outsourced, the IDOS varies more (see Figure 4.8). Each colour represents a quarter and the first quarter is on the left, while the fourth is on the right.

4.3 Project Metrics

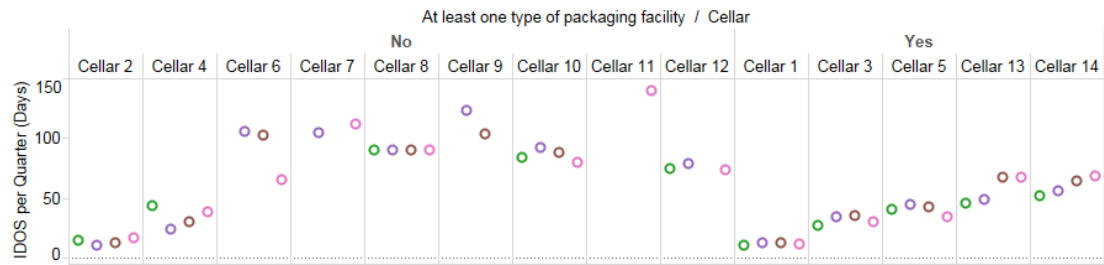


Figure 4.8: IDOS of Cellars per Quarter

Debtors and creditors days were also measured at some cellars. One challenge associated with these metrics is that the data used for calculating the metrics is confidential. The information is mostly available and can be calculated from the same information that is used for the financial statements.

From the measurements of round 1 and 2 it could be seen that the industry is more prepared for measuring some metrics than others. This can be seen from the availability of data indicated in Table 4.5. The process of measuring opened up opportunities to identify and discuss important decisions related to the attributes. Challenges regarding the availability and accessibility of data for measurements reduced the total number of metrics that was measured during the project.

## 4.4 Conclusion

The local wine industry was found to be characterised by a variety of factors. A long winemaking process, complex sourcing environment as well as a tendency to outsource and keep inventory were some of the important characteristics. Production is mainly focused on inventory management and packaging. The options available for outsourcing, packaging and customers creates the opportunity to distinguish supply chains, but also increases complexity. Supply chains can be defined by the decisions that are made in terms of the identified characteristics.

Part of understanding the local wine industry meant that the current state of performance measurement had to be evaluated. The practical measurements that were received from industry did not provide the information that is necessary to make the identified decisions. One concern regarding information is the availability, but another problem is that it is not used for reporting purposes and therefore it is not accessible. These challenges have to be overcome before benchmarks can be provided.

The dependence of performance measurement on information means that the process of supply chain performance improvement can only continue once the information becomes available. The next chapter will look at a process through which this can be achieved in the future.

## Chapter 5

# Conclusions

From the results of the study it is possible to conclude on what the implications for the industry are and also describe what the way forward should look like. Chapter 4 identified the current strategies and characteristics of the industry. It is necessary to determine whether alignment between strategies and the drivers of the industry exist and what a process of alignment entails. To address this matter, a process that enables cellars to improve the alignment between their own strategies and characteristics was identified.

The aim of this chapter is to indicate what this process will look like, by considering the local packaged industry as it was evaluated in chapter 4 and presenting the insight gained from current characteristics. The knowledge of an existing framework is applied to propose a process of strategy formulation and selection. This process is discussed in section 5.1.

The supply chain environment is dynamic and changing. The characteristics that drive the industry today may be different from the ones that should be taken into account in the near future. For this reason, it is important to also discuss the next steps in the process.

It was found that the information required to measure performance is not yet available. New information may lead to different characteristics, drivers and decisions. Conclusions regarding concepts such as segmentation, strategy selection, internal per-

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## 5.1 Perez Framework Application

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formance measurement and benchmarking are discussed in section 5.2. Reference to the current state is used to describe the requirements that are necessary to achieve the desired state.

### 5.1 Perez Framework Application

The wine industry of South Africa was evaluated according to the Supply Chain Roadmap (discussed in section 2.1.2) and the outcome of the evaluation is now presented. This framework aims to help organisations align supply chain and business strategies by looking at the business framework (industry environment), unique value proposal (competitive positioning of the organisation) as well as the supply chain processes (Perez, 2013).

The idea was to use an established framework to interpret the characteristics of the industry, as identified in the results. Some additional characteristics of the industry are mentioned in this section that were not addressed directly in 4. As part of interpreting and translating the characteristics according to the framework structure, additional factors were used.

This analysis can help cellars to think about their supply chains and the market they compete in. Only the business framework was evaluated, since the other two sections of the framework (*unique value proposal* and *supply chain processes*) will be specific to each cellar or supply chain within a cellar.

Six factors were selected from the business framework to describe the industry characteristics. Some of the factors (such as sourcing complexity and demand variation) were discussed as part of the results. The motivation for selecting each factor is given in section 5.1.1, although most of these factors have been discussed previously. A description of the evaluation of each criteria can also be seen in this section. With the use of the framework tools, the evaluation is used to identify common patterns supply chain strategies. These will be discussed in sections 5.1.2 and 5.1.3.

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## 5.1 Perez Framework Application

### 5.1.1 Criteria Motivation and Evaluation

Six of the characteristics within the business framework were selected as being critical or relevant in the local wine industry. These characteristics distinguish wine from other products or industries and will be used to identify best practices according to the recommendations of the framework tools. These are:

- Sourcing Complexity
- Gross Margins in Industry
- Transport Cost Relevance
- Customer's Power
- Demand variation
- Product Renewal Rate

Sourcing complexity is defined by three factors: The number of sourcing Stock Keeping Units (SKU's), number of suppliers and the sourcing lead time. This was found to be highly relevant in the local wine industry due to the long lead time of various dry goods. Cellars are often large distances from suppliers which increases complexity with regards to sourcing and delivery. Lead time for some of the dry goods were measured and varied from 2 to 63 days.

The relationship between product cost and product price is a key measure of the size of typical gross margins in the industry. This characteristic was not identified in chapter 4, since it is not associated with data. Participants however mentioned that low profit margins is a concerning factor (especially for lower price point wines). Gross margins of mass-market or commoditised products are lower in general and wine can fall within this category (MarketLine, 2014). Ewert *et al.* (2014) also mentioned that the wine industry faces challenges of low margins .

Transport cost is seen as a critical factor in the wine industry due to the long distances travelled to the market. The wine regions are mainly situated in the Western Cape and products must be distributed to consumers across the country. In addition,

## 5.1 Perez Framework Application

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raw materials often come from larger cities which can be far. Packaged wine is a heavy and fragile product, which increases the complexity of transportation.

According to an international study, the South African market experiences a medium power of buyers. Drivers that increase the power of buyers are buyers' independence, a low cost of switching and price sensitivity. The ability for producers to distinguish their products (through a large product variety) decreases buyer's power (MarketLine, 2014). When evaluated according to the scale of the Supply Chain Roadmap, this is seen as high customer power.

Demand variation is seen as a critical characteristic due to the seasonal increase of demand from consumers over celebration periods. This includes Christmas and Easter as well as other events. The description of a high demand variation is applicable to the local wine industry. When the demand profile has size peaks of around 50% of the average demand, it is seen as high variation. During interviews with distributors, this increase in demand was confirmed for the wine industry.

Product renewal rate refers to the rate of introduction of new SKUs with medium to major changes into the category (Perez, 2013). This factor was selected as critical since it distinguishes the wine industry from many other industries. Due to the annual harvest, products are renewed at least once a year.

The evaluation for the six characteristics as well as definition of the selected category is shown in Table 5.1. Each characteristic can be evaluated as low, medium, high or very high. The evaluation of the entire business framework is presented in Appendix D, Table D.1.

### 5.1.2 Industry Common Patterns

Four common patterns are relevant to the characteristics of the wine industry, based on the evaluation displayed in Table 5.1. Each pattern is identified based on one of the characteristics of the industry. The practices recommended are high or medium asset utilisation, inventory buffer and multiple suppliers for dry goods as well as minimum order quantities. Appendix D provides more information on the common patterns.



## 5.1 Perez Framework Application

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To address the complexity of sourcing, more than one supplier should be used for dry goods and inventory should be kept. If packaging is outsourced, the dry goods has to be supplied. In cases where standard materials are used it may be possible for the bottling company to supply some materials.

The combination of low gross margins and high demand variation results in two different recommendations with regards to asset utilisation. Therefore, products or customers should be segmented to separate commoditised and evolving industries. Cellars should consider their combination of products and markets and assess which products are suitable for evolving or commoditised markets. It can also be that some customers require either commoditised or evolving products. A segmentation criteria is therefore selected according to the specific situation of the cellar.

Due to high transportation costs, cellars should aim to ensure that order sizes enable economic batches. It may be necessary to implement a minimum order policy if ordering patterns cause additional loads. Where the cost of transportation is not significant compared to the value of the wine, this principle will not be relevant.

## 5.1 Perez Framework Application

Table 5.1: Evaluation of Critical Characteristics

| Characteristic            | Evaluation             | Definition  |
|---------------------------|------------------------|---|
| Sourcing Complexity       | High                   | Two of the three sourcing variables (sourced SKUs, number of suppliers, or sourcing lead time) becomes greater and creates relevant complexity for the management.                                      |
| Gross margins in industry | Very High <sup>1</sup> | It is a category with a very low gross margin. (<20%).  |
| Transport cost relevance  | Very High              | The relationship of product price per cube is low because the cost of transportation is highly significant (>10%) in the cost structure. Full truckloads is compulsory to optimise transportation cost. |
| Customer's power          | High                   | There is a balance between supply and demand, but changes in global prices can increase the supply of foreign producers, giving customers more choices.   |
| Demand variation          | High                   | The demand profile has high size peaks (around 50% of the average demand).  |
| Product renewal rate      | Medium                 | Products are renewed on an annual basis, affected by fashion or changes in technology.  |

(Perez, 2013)

### 5.1.3 Supply Chain Strategies

Two of the generic supply chain strategies of the framework were found to be equally relevant to the industry - efficient and agile supply chain strategies. The strategies were selected based on the characteristics discussed in Table 5.1. Each of the six generic supply chain strategies are defined by 3 or 4 characteristics of the business framework (see Appendix A for definitions of generic supply chains). The characteristics that

<sup>1</sup>The gross margins in the industry is measured by the ratio between product cost and product price. When this ratio is high, the gross margins are low.

## 5.2 Current and Future Industry Practices

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determined the decision are demand variation and product renewal rate.

An efficient supply chain, as characterised by Perez (2013), is one that is most relevant to markets where products compete based on their price since consumers do not necessarily experience major differences between various products within a category. This supply chain strategy is selected due the relevance of high demand variation and medium product renewal rate.

An agile supply chain is a supply chain that is adapted to manage high demand variation. The product renewal rate for agile supply chains are usually high or very high, which means that new products are released every few weeks or customisation can be applied to orders. Price becomes less important and it becomes a challenge to keep asset utilisation high when customising orders (Perez, 2013). The agile supply chain is one of the three strategies oriented to responsiveness.

The recommendations are made for the packaged local industry as a whole (based on the identified characteristics). Other strategies may also be relevant when further segmentation is implemented and more supply chains are identified within the local industry. When the unique value proposal and supply chain activities are also evaluated, there will be more common characteristics.

## 5.2 Current and Future Industry Practices

In section 5.1 a process of alignment and strategy formulation was described. The results from section 4.3 however indicated that supply chain maturity must improve before further measurement. Maturity in this context relates to the ability of the industry to capture data and measure performance.

Measuring performance of the industry means that a large group of cellars should be able to provide useful information regarding their processes and performance. It can then be used to calculate benchmarks and suggest a direction for the industry as a whole. Internal performance measurement is the first step towards benchmarking. Cellars should aim to view benchmarking exercises as an opportunity to improve internal reporting and measurement practices rather than a process of extracting data.

## 5.2 Current and Future Industry Practices

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The performance metrics that were measured could be utilised as benchmarks when they are measured by a large part of the industry. The process of measurement (and defining metrics) was approached in a way that makes it possible for the entire industry to measure the same metrics.

Each cellar has a unique combination of characteristics in terms of supply chain design, size and product variety. Segmenting cellars and supply chains based on these characteristics when calculating benchmarks will enable effective comparison. From the survey and interviews, the current factors were recognised. It was seen that outsourcing, high levels of finished goods and long sourcing lead times characterise the industry.

To determine whether these practices are the best practices for individual cellars, performance metrics can be the source of feedback. Knowing the influence of decisions on reliability, responsiveness, agility, cost and assets enables informed planning and decision-making. If some characteristics have a significant impact on performance it is also necessary to segment.

Customer segmentation was investigated by collecting information on three types of customers (restaurants, retailers and distributors). The results indicated that although customers do not act the same, it is not dependant on the customer only. The cellars that perceived customers to act similarly all produced small volumes and this may influence how customers are experienced and managed.

Packaging facilities influence the performance of inventory management (dry goods and finished goods inventory are affected). Segmenting product categories based on whether the cellar owns the facilities or whether it is outsourced can therefore be considered. Additional information on the impact of packaging facilities on agility, cost and responsiveness can complete this decision.

Segmentation for internal measurement and industry benchmarking can differ. It is highly recommended that cellars should segment products and customers for internal performance measurement. The benefit of segmentation is that insight is gained, but the complexity of capturing information also increases. In terms of benchmarking, segmentation should be approached when more information is available.

## 5.2 Current and Future Industry Practices

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When considering these conclusions, most of the outcomes point towards an increase of information. The next step towards informed decision-making and strategy formulation is therefore to start measuring performance. Internal performance measurement and industry benchmarking both depend on the availability of information. Knowing which metrics to measure is critical. The number of supply chain metrics is overwhelming and diverse. Various industries are addressed and definitions are not interpreted. A framework to make sense of these metrics is required to identify ones that will take the industry forward. The framework that is presented in chapter 6 is believed to include the metrics that is essential to the packaged local wine market.

## Chapter 6

# Findings and Recommendations

This chapter will discuss the performance measurement framework that was developed for the packaged local segment of the wine supply chain. The framework is proposed to the industry as the necessary action to collect relevant information for decision-making and also to enable the process of formulating a supply chain strategy. The metrics could be selected after an investigation of the industry drivers, characteristics, strategies and decisions. Literature also played a significant role in the design of the framework.

The need for developing performance metrics for both internal performance measurement and external benchmarking was identified in the industry. Benchmarks provide organisations with a perspective of the performance of other organisations in the industry, while internal performance measurement forms an integral part of management of operations and decision making.

Neely *et al.* (1995) mentioned that the broadest goal of performance measurement is to secure control of the organisation. Organisations in a supply chain depend on each other and affect one another through decision making. It is therefore important to perform both internal and supply chain wide measurement in order to minimise cost across the entire supply chain (Aramyan, 2007).

## 6.1 Metric Selection

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The aims of the framework are formulated as follows:

1. Enabling decision making
2. Improving supply chain strategy formulation and execution
3. Indicating the diagnostic Key Performance Indicators (KPI's)

The framework aims to address and benchmark cellars, but the operations of the entire supply chain were investigated. This means that the metrics are to be measured by the cellars and the benchmarks will provide them with information to make decisions concerning the source, make/production, deliver and planning functions. The activities included range from the sourcing of grapes until a cellar sells the wine to a customer and payment is received.

### 6.1 Metric Selection

Selecting supply chain metrics is a challenging task due to the overwhelming variety of measures and possible definitions. The complexity of the decision-making criteria for selecting metrics further explains why a framework is necessary for performance measurement. The metrics for this framework were sourced from four frameworks and these are listed in Table 6.1. By limiting the total number of metrics from which selection will take place, each metric could be considered and evaluated according to the relevance in the industry and the value it will add to the framework in terms of the aims.

The first two frameworks are not industry specific and provide a wide range of metrics for any supply chain. SCOR provides a standard language for defining processes and metrics. This simplifies benchmarking and industry process mapping. It is often seen as the industry standard for supply chain performance measurement and mapping (Stewart, 1997).

Perez (2013) focused on defining and formulating a supply chain strategy that is aligned with the business strategy of an organisation. The framework was considered as

## 6.1 Metric Selection

Table 6.1: Frameworks used for selecting Metrics

| Framework   | Application             | Important Characteristic                                      | Year |
|---|-------------------------|---|------|
| 1. Supply Chain Operations Reference Model                    | Any Supply Chain        | Supply chain standard   | 2011 |
| 2. Supply Chain Roadmap                                       | Any Supply Chain        | Focus on supply chain strategy                                | 2013 |
| 3. Measuring Logistics Performance in the Wine Industry       | Wine supply Chains      | Wine industry specific  | 2012 |
| 4. Measuring Supply Chain Performance in the Agri-food Sector | Agri-food Supply Chains | Focus on identifying important characteristics of an industry | 2007 |

(SCC, 2012), (Perez, 2013), (Garcia *et al.*, 2012), (Aramyan, 2007)

a performance measurement framework since it provides metrics for each type of supply chain strategy. Based on the analysis of the industry according to this framework (see section 2.1.2 and 5.1), certain metrics could be selected to provide more detail on important strategies.

Garcia *et al.* (2012) developed a framework for the wine industry in Argentina. This framework assisted with providing metrics as well as definitions especially where other frameworks did not provide enough detail. Although most metrics are seen in other frameworks as well, the definitions are adapted to the wine industry. Measurements regarding the make processes are useful since they relate to the packaging processes of wine (bottling, labelling) and take the ageing process into account.

Research on the agri-food supply chain was considered due to the similarities of the development process that was followed. Aramyan (2007) highlighted the importance of analysing the characteristics of the industry and then selecting metrics accordingly. The wine industry forms part of the agri-foods industry and share some important similarities with agri-foods supply chains. The most important aspect is the fact that these industries are exposed to a high level of uncertainty of supply due to climate changes.



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## 6.2 Performance Metrics of the Framework

### 6.2 Performance Metrics of the Framework

The performance metrics of the framework are grouped according to the five attributes of the SCOR framework. Level one metrics aim to provide an overview of the health of the organisation in terms of the corresponding attribute. Level two metrics are diagnostic measures and explain the results of level one metrics. The root cause of a problem can be identified when lower level metrics are measured.

Differences in terms of definitions and segmentation can occur when measuring performance for internal performance measurement and external benchmarking. A cellar may find it beneficial to adapt a metric or apply segmentation when using it for internal performance measurement. Definitions of the framework metrics are provided in Appendix B and these are standard definitions that can be used for external benchmarking or internal performance measurement. The metrics of the framework are displayed in Table 6.2. The relating level one and two metrics are placed next to each other.

The discussion of the metrics aim to highlight the relevance of the metrics to the industry. Measuring performance requires effort and therefore the total number of metrics had to be achievable. The selected metrics address the characteristics of the local wine industry. By referring to some of the relevant characteristics and decisions, sections 6.2.1 to 6.2.5 will indicate why the framework has the ability to improve the performance of local supply chains.

#### 6.2.1 Reliability

Reliability is concerned with the experience of the customer. A reliable organisation is able to provide a predictable service and product (SCC, 2012). Perfect order fulfilment is the level one metric for reliability and measures the percentage of perfect orders. Cellars are able to distinguish themselves from other competitors in the market based on reliability by using it to build trust.

For an order to be perfect, it must be delivered on time, the documentation must be correct, the agreed quantity of each product must be delivered and all products must be in a perfect condition. Imperfect orders may be caused by any of the activities preceding

## 6.2 Performance Metrics of the Framework

Table 6.2: Performance Measurement Framework Metrics

| Attribute      | Level 1   | Level 2   |
|----------------|---|---|
| Reliability    | Perfect order fulfilment<br><br><br><br>Dry goods supplier order accuracy | % Orders delivered in full<br>Delivery performance to customer commit date<br>Documentation accuracy<br>Perfect condition |
| Responsiveness | Order fulfillment cycle time  | Internal order cycle time<br>Source cycle time (Dry goods)  |
| Agility        | Average resource utilization of all equipment                             | Resource utilization<br><br>Deliver demand variation  |
| Cost           | Total logistics cost  | Sourcing cost relevance<br>Transportation cost relevance<br>Packaging cost  |
| Assets         | Cash-to-cash cycle time   | Creditors days<br>Debtors days<br>Inventory days of supply - Finished goods<br>Inventory days of supply - Dry goods       |

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## 6.2 Performance Metrics of the Framework

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the final delivery. The first step to identifying the root cause is to categorise the problems that occurred and determine the number of orders where a problem occurred. The level two metrics for reliability is included in the framework for this purpose. The result of these metrics indicate which processes must be addressed or further investigate. Possibilities include documentation processing, delivery and packaging.

The information from the metrics can further be used to make decisions concerning customisation and whether the additional complexity is valued by the customer. The fact that the supply environment was identified as complex, encourages the measurement of suppliers' performance. If suppliers are not providing a reliable service and product, the effect will be seen in delayed fulfilment of customer orders or increased inventory. By measuring the supplier lead time, it can be identified which products and suppliers perform below an acceptable standard.

### 6.2.2 Responsiveness

Responsiveness refers to the speed of execution and delivery of customer orders. It is an attribute that relates to customer orders and order fulfilment cycle time is the main metric.

Lead times have a significant influence on the wine industry. It is not uncommon for cellars to be far from the market and suppliers, since grapes are grown in specific regions. Longer lead times increases the amount of safety stock that should be kept. In an industry where cash flow is already a challenge, reduced amounts of inventory can provide financial benefits. Information on the speed of activities enable decisions in this manner.

Since many consumers and customers experience wine as a substitutable product, responsiveness is most relevant when an order is placed by a final customer (thus the order fulfilment cycle time). The final customer (selling the product to the consumer) could be a retailer, independent liquor store or restaurant. Customers do not want to keep unnecessary inventory and the responsive cellar can benefit from satisfied and returning customers.

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## 6.2 Performance Metrics of the Framework

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The total cycle time can be broken down according to the functions and responsibilities of the cellar. Order cycle time measures the time it takes to execute an order from when it was received until it was delivered. It is important to recognise who is responsible for a delay and therefore internal order cycle time is measured apart from the total cycle time. Knowing the cycle time can help with decisions about outsourcing. An example of this could be where a certain process or function is keeping the cellar from decreasing the minimum lead time. In this case occasional outsourcing can be considered.

Responsive suppliers can enable a sourcing strategy where inventory is kept low. The absence of dry goods inventory can easily cause customer orders to be late. Supplier responsiveness provides information that should influence the selection of suppliers for dry goods and raw materials.

### 6.2.3 Agility

The purpose of measuring agility is to quantify or measure the ability of a cellar to sustainably increase and decrease the amount of completed orders. It was necessary to separate the packaging and wine-making processes for the metrics of agility due to the difference in duration it takes to complete. Packaging can be completed in a few hours, while the wine-making process take anything from 3 months to two years.

Agility in the packaging environment relates to the level of postponement that can be applied to finished goods. An agile cellar would be able to postpone packaging process until an order is received, without increasing the standard cycle time. To determine this ability, it is suggested that resource utilisation is measured. Spare capacity on packaging machines means orders can be prepared quickly according to customer specifications. Measuring utilisation as an average of all equipment enables higher level decisions. An example of where the metric can be used is as part of the supply chain strategy. The strategy of the cellar should define whether the aim is to have high resource utilisation (and aim to keep costs low) or to use the flexibility as an advantage to enable responsiveness. Knowing the current agility (as an overall and per equipment measure) is the starting point of considering options.

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## 6.2 Performance Metrics of the Framework

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Factors influencing agility include the speed of processing orders (documentation) and the speed of decision making. Decisions regarding longer and shorter term capacity can be made by considering the average utilisation of current processes. Longer term considerations for a cellar include the capacity of wine making equipment, bulk storage space, packaged storage space and the capacity of packaging equipment. Shorter term considerations include the volume of additional wine bought in, possibilities to out-source packaging, speed of decision making, dry goods availability and spare capacity of current packaging equipment.

An agile cellar is also one that can think creatively and make plans where capacity, inventory or any market related problems occur. Oertle (2015) highlighted communication, quick decision making and being prepared for change as the enablers of agility.

### 6.2.4 Cost

There are countless costs within a supply chain that are important. Measuring cost is definitely one of the most important sources of information for decision making and relevant data should be available. The framework only includes costs that are linked to strategic decisions identified in the wine industry (decisions about packaging facilities and transportation resources).

The total supply chain cost is defined as the sum of supply, production, inventory, warehousing, transportation, return cost and customer response cost (Garcia *et al.*, 2012). Total supply chain cost is important since it measures not only the cost of the product, but also the cost of the route to market (Retief, 2015). Some products may be more successful in certain markets due to the relevance of the various costs in terms of the total supply chain cost. For this reason, transportation and sourcing cost metrics are formulated in terms of its relevance.

The sourcing cost is measured as a factor of the total cost of the finished product and the transportation cost is measured per volume. Sourcing and transportation cost metrics encourage critical thinking about the use of packaging types, transportation methods, resource utilisation, routes to market and outsourcing.

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## 6.2 Performance Metrics of the Framework

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Transportation cost is highly relevant for the South African wine industry due to the large distances travelled, high transportation costs and the lack of alternative methods to road transport. The fact that the sourcing environment is experienced as complex motivates the necessity to obtain information for comparing alternatives.

Financial information is always available in the form of income statements and balance sheets. Although these reports provide valuable information, they are not created for the purpose of supply chain measurement. Segmenting from this information is usually not possible and it will take additional input to plan where the data should be captured for the metrics.

### 6.2.5 Asset Management Efficiency

Asset management aims to measure how efficient the assets of an organisation are used. Inventory strategies and the decision to in-source or outsource are important considerations for this metric (SCC, 2012). The main aim of measuring inventory days of supply is to achieve optimal inventory levels.

Cash-to-cash cycle time is the level 1 metric for asset management. The fact that the wine industry is cash flow sensitive increases the importance of asset management. Cash flow constraints influence outsourcing and distribution decisions since outsourcing can create opportunities to reduce inventory or receive payments earlier. Inventory management causes the most challenges for a cellar and reducing inventory will have a significant financial impact. The importance of measuring inventory days of supply for both dry goods and finished goods is enhanced by the fact that Make-to-stock strategies are mostly used.

The availability of inventory has implications for the whole supply chain. The consequences of a stock-out has short and long term effects. Predictable payments and orders can improve cash flow since it enables a cellar to plan production (Oertle, 2015).

## 6.3 Conclusion

The discussion on the attributes of the framework (sections 6.2.1 - 6.2.5) aimed to explain why certain metrics were selected for the framework. There are however other sources of validation that should also be recognised:

- The process of metric selection
- Aims of the framework
- Characteristics of the industry
- Important decisions identified

Selecting metrics from four relevant frameworks meant that all of the metrics were possibilities. The risk of selecting a metric that would not add value was reduced in this process. Standard definitions and calculations could be provided where the metric has not yet been measured in the wine industry. The metrics that were measured as part of the project could be adapted for the local wine industry. The metrics were tailored as far as possible through discussions with participants, auditors, the South African wine industry information and statistics (SAWIS) as well as other relevant parties.

Setting three specific aims for the framework enabled the incorporation of the characteristics and decisions into the framework. The aims guided the selection of metrics from the metrics of the four frameworks.

Validation from industry participants is included as part of the characteristics that were identified and taken into account when selecting metrics. The characteristics were identified (and validated) from interviews and survey information.

The framework is structured according to the five attributes of the SCOR framework. Metrics are classified as either level one, two or three, depending on whether participants should measure strategic or operational functions. No specific segmentation method was prescribed for the framework, but it is recommended that cellars segment according to their own operations.

### 6.3 Conclusion

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The framework is presented to the industry as a tool to gather supply chain information. The three aims indicated what this information should be used for: decision-making, formulate supply chain strategies and identify key performance indicators. The metrics are selected based on the current characteristics of the industry and should therefore be adapted when the environment changes.



## Chapter 7

# Summary and Conclusion

This project presented a performance measurement framework to the local South African wine industry. The supply chain performance of the local wine industry can be improved in the future when the metrics of the framework are measured. The metrics were carefully selected to address the industry characteristics and provide the information that is required to make important decisions. A focus was placed on strategic and tactical decisions, rather than operational decisions. These characteristics and decisions were identified through an investigation of the wine industry over the course of the project.

An agile design methodology was followed which made room for insights to be taken into account throughout the duration of the investigation. The research methods included interviews, survey questionnaires and workshop sessions.

The project was supported by several partners that included cellars, distributors, retailers, researchers, academics and industry bodies. Information was gathered from all parties to identify the characteristics of the industry. Cellars were seen as the most important partners in the supply chain.

Currently it is important to participants to focus on cost. Most cellars either aim to achieve superior or advantage performance in terms of cost. Other important metrics are reliability and responsiveness. High levels of outsourcing and finished goods inventory, long sourcing lead times and medium demand variation are some of the

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characteristics of the local wine supply chain. Sourcing is complex due to supply uncertainty. The production environment is also complex, but rather due to the variety of options available. Inventory management decisions are important because of finished goods availability and cash flow management. Any inventory that has to be stored (finished goods, dry goods or unfinished goods) must be financed. This reduces the cash in the business and causes the industry to be cash flow sensitive. Outsourcing creates a dependency on partners, but synergies can also be achieved in this way.

It was seen that cellars owning their own packaging facilities carry less inventory. This relationship motivates the notion to segment cellars or products based on whether packaging is outsourced (for industry benchmarking). Results of more performance metrics should be taken into account before making this decision. From an example of comparing five similar cellars, it was seen that although a MTS strategy increases finished goods inventory, it also means that less dry goods inventory is stored. It may be due to the fact that planning can be improved.

The direct customers of cellars are distributors, retailers and restaurants. These customers represent 97.5% of cellars' local sales. The relationships between cellars and customers vary quite significantly and it cannot be said whether it is dependent on the customers or the cellars characteristics. Small cellars however perceive their customers to be similar in terms of the size and frequency of orders placed. To indicate the relevance of characteristics, supply chain decisions were identified. Information can enable decision-making in the future. It is also important to be informed about the impact of alternatives on performance.

Although the consumer was not considered as part of the focus of this study, it is important to take note how consumers make decisions when buying wine. The fact that the consumer is able to choose from a very wide variety of products means that wine is a substitutable product to most consumers.

During the first round of measurement order cycle time, order fulfilment rate, transportation cost, storage cost, upside supply chain flexibility and IDOS were measured. During the second round order cycle time, order fulfilment rate (from distributors perspective) IDOS, debtors days and creditors days were measured. Many metrics could not be measured accurately due to lack of information and standardised data capturing.

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Data is not flexible and could not be adapted to definitions. Some information is also not captured yet.

The process that was used to gather information on the industry indicated how characteristics, decisions and strategies can be identified. Measurement must improve in order to create benchmarks. It was indicated what a process of strategy formulation could look like by making use of an existing framework. Based on the current characteristics of the industry, cellars can consider either an agile or an efficient strategy for their packaged local products. The decision is determined by the demand variation and product renewal rate. Efficient supply chain strategies should be implemented for standard products that are renewed less often.

The performance measurement framework presented in chapter 6 is the suggested approach to achieve supply chain performance improvement. The metrics of the framework addresses the industry characteristics and also measure the key performance indicators. It can therefore be seen as the next step that is required. The framework guides cellars on how to improve internal performance measurement by prioritising metrics and identifying a limited number of critical metrics.

Segmentation will bring insight, but it increases the complexity of information capturing and measurement. Segmentation for internal measurement is highly recommended, but for benchmarking purposes it should be investigated further with more information.

The project provides a thorough solution to the industry, since it discusses both the process and outcome. Even though some information is not yet available, the performance measurement framework specified what the outcome will look like from the characteristics that could be identified with current information. Figure 7.1 indicates how each part of the solution leads to the next.

Measuring the performance of the industry provides data and information that can be used to identify the characteristics that drive the supply chain. Based on the characteristics and information, the necessary decisions can be made. Formulating strategies, segmentation and general decision-making are the important processes that rely on the information. A performance measurement framework can be established

7.1 Recommendations for Further Research

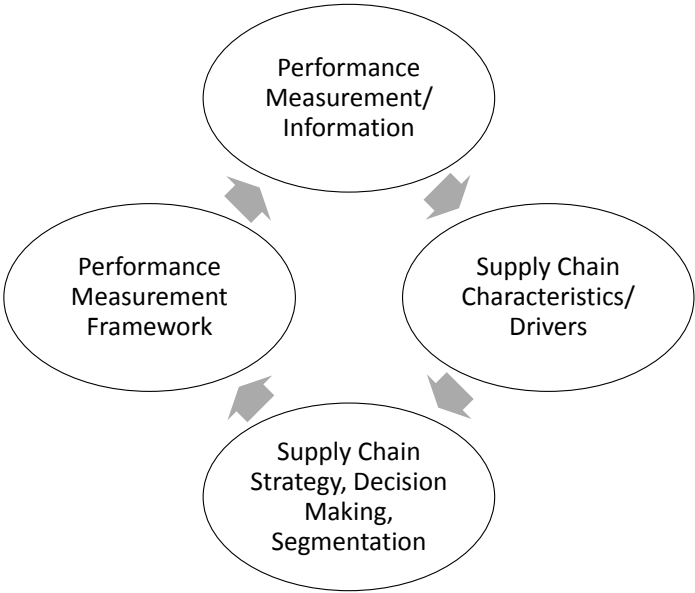


Figure 7.1: Components of the suggested solution

when information is available to select relevant metrics. The results of this project included all four aspects of Figure 7.1, and therefore it is seen as a thorough solution. With the availability of more information, the process can be repeated to make better decisions.

7.1 Recommendations for Further Research

From the results, topics for further research can be recommended. Most recommendations relate to performance measurement, supply chain processes, best practices and information systems.

The project indicated that the next step towards performance measurement and benchmarking is to measure all the performance metrics of the framework. It is therefore necessary to increase the availability of data and information for supply chain metrics. Further investigation of decision-making and performance measurement is necessary and it also a requirement for most of the suggested topics of further research.

The process of identifying the characteristics of the wine supply chain indicated the

## 7.1 Recommendations for Further Research

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variety of options available in terms of supply chain design. Some specific topics for further investigation are suggested to increase understanding of the characteristics of the industry:

- Work should be done to explain the relationship between the important supply chain decisions and the performance metrics of the framework.
- Investigation of agile and efficient supply chain strategies within the local wine industry. A practical description of what each of these strategies will look like for the wine industry should be investigated.
- Research on the influence of demand variation on inventory management practices. It would be valuable to provide a definition for high and low demand variation in terms of sales volumes.
- Evaluation of resource utilisation at cellars and the influence on flexibility and customer satisfaction. A quantification of resource utilisation could help cellars to implement the metric in an optimal manner.
- Application of the Supply Chain Roadmap framework at individual cellars as well as further research on the development of supply chain strategies for individual cellars. With available data on the performance of costs and resource utilisation this evaluation can be repeated and customised for individual cellars.
- Investigation of supply chain decision-making practices at wine cellars to identify the methods and sources of information used for making decisions. It should be investigated whether accurate sources of information are used to make decisions and whether decision making strategies can be improved.
- Assessment of the available software options for wine cellars. It would be valuable to investigate the current options, but also summarise the functions that cellars could benefit from when managing inventory and sales. Implementing new software is a challenging decision, but technology can improve information capturing and management at a cellar.

## **7.1 Recommendations for Further Research**

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The definitions and calculations of the metrics of the framework should be developed further. Some of the metrics have not been measured in the industry and may need further explanation. Further research could be conducted by working closely with auditors to investigate how financial information can be used optimally for decision making - in general management and also in the supply chain environment.

Another aspect that could be investigated for the packaged segment is distribution into the rest of Africa. Several cellars are already approaching neighbouring countries by making use of similar supply chains to those used within South Africa. Other challenges however apply and therefore it can be beneficial to also investigate the characteristics and strategies of these supply chains.

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## Appendix A

# Generic Supply Chain Strategies and Patterns

### A.1 Generic Supply Chain Strategies (Archetypes)

The following pages show the six generic supply chain strategies as identified by Perez (2013). The framework was explained in section [2.1.2](#).

## A.1 Generic Supply Chain Strategies (Archetypes)

| Business Framework  |  |   |                               |                                       |                                |                                  |                             |                           |                  |                            |                         |                  |                      |                            |
|---|--|---|-------------------------------|---------------------------------------|--------------------------------|----------------------------------|-----------------------------|---------------------------|------------------|----------------------------|-------------------------|------------------|----------------------|----------------------------|
| Sourcing view   |  |   |                               | Technology view                       |                                |                                  | Demand view                 |                           |                  |                            |                         |                  |                      |                            |
|   | Complexity   | Disruption risk                               | Suppliers Power               | Cost relevance                        | Maturity                       | Scale of productive assets       | Assets cost relevance       | Gross margins in industry | Customer's power | Relevance in customer cost | Market uncertainty cost | Demand variation | Product renewal rate | Transport's cost relevance |
| Very high<br>High<br>Medium<br>Low  | ○  | ○   | ○                             | ○                                     | ○                              | ○                                | ●                           | ○                         | ○                | ○                          | ○                       | ○                | ○                    | ○                          |
|   | ○  | ○   | ○                             | ○                                     | ○                              | ○                                | ●                           | ○                         | ○                | ○                          | ○                       | ●                | ○                    | ○                          |
|   | ○  | ○   | ○                             | ○                                     | ○                              | ○                                | ○                           | ○                         | ○                | ○                          | ○                       | ●                | ○                    | ○                          |
|   | ○  | ○   | ○                             | ○                                     | ○                              | ○                                | ○                           | ○                         | ○                | ○                          | ○                       | ○                | ●                    | ○                          |
| Unique Value Proposal   |  |   |                               |                                       |                                |                                  |                             |                           |                  |                            |                         |                  |                      |                            |
|   | Product Attributes   |   |                               |                                       | Service Attributes             |                                  |                             |                           |                  |                            |                         |                  |                      |                            |
| Main proposal<br>Best of the industry<br>Avg. of the industry<br>Not relevant | Ratio benefits/price                                       | Range of portfolio                            | Product adaptability          | Price                                 | Innovation                     | Time from idea to market         | Agility to demand variation | Working capital           | Lead time        | Minimum order quantity     | Perfect orders          | Order entry      |                      |                            |
|   | ○  | ○   | ○                             | ●                                     | ○                              | ○                                | ○                           | ○                         | ○                | ○                          | ○                       | ○                |                      |                            |
|   | ○  | ○   | ○                             | ●                                     | ○                              | ○                                | ○                           | ○                         | ○                | ○                          | ●                       | ○                |                      |                            |
|   | ○  | ○   | ○                             | ○                                     | ○                              | ○                                | ○                           | ○                         | ○                | ○                          | ○                       | ○                |                      |                            |
| Supply Chain Processes  |  |   |                               |                                       |                                |                                  |                             |                           |                  |                            |                         |                  |                      |                            |
| Sourcing  |  | Plan & Make                                   |                               | Demand Fulfillment                    |                                |                                  | Managerial Focus            |                           |                  |                            |                         |                  |                      |                            |
| Collaboration   | Inventory strategy   | Product                                       | Collaboration                 | Order cycle                           | Supplier's                     | Product design                   |                             |                           |                  |                            |                         |                  |                      |                            |
| N/A   | High level of inventory to optimise production efficiency  | Standardised product                          | N/A                           | Fixed cycle or fixed lead time        | Lowest cost supplier           | Low cost at standard performance |                             |                           |                  |                            |                         |                  |                      |                            |
| Buffering   | Assets utilization   | Order penetration                             | Buffering                     | Minimum order                         | Transformation                 | Service design                   |                             |                           |                  |                            |                         |                  |                      |                            |
|   | Very high  | Make to forecast (MTF), in some occasions MTO | Inventory of finished product | Minimum economic transportation batch | High rate of asset utilisation | Perfect order fulfilment         |                             |                           |                  |                            |                         |                  |                      |                            |
|   | Production cycle   |   |                               |                                       |                                | End to end                       |                             |                           |                  |                            |                         |                  |                      |                            |
|   | As long as possible to increase batch sizes and efficiency |   |                               |                                       |                                | Efficiency                       |                             |                           |                  |                            |                         |                  |                      |                            |

Figure A.1: Efficient Supply Chain Strategy

## A.1 Generic Supply Chain Strategies (Archetypes)

| Business Framework  |  |                              |  |  |  |                                  |                             |                           |                  |                            |                    |                              |                      |                            |
|---|--|------------------------------|--|--|--|----------------------------------|-----------------------------|---------------------------|------------------|----------------------------|--------------------|------------------------------|----------------------|----------------------------|
| Sourcing view   |  |                              |  | Technology view                            |  |                                  | Demand view                 |                           |                  |                            |                    |                              |                      |                            |
|   | Complexity   | Disruption risk              | Suppliers Power                                | Cost relevance                             | Maturity   | Scale of productive assets       | Assets cost relevance       | Gross margins in industry | Customer's power | Relevance in customer cost | Market uncertainty | Demand variation             | Product renewal rate | Transport's cost relevance |
| Very high<br>High<br>Medium<br>Low  | ○  | ○                            | ○  | ○  | ○  | ○                                | ○                           | ○                         | ○                | ○                          | ●                  | ○                            | ●                    | ○                          |
|   | ○  | ○                            | ○  | ●  | ○  | ○                                | ○                           | ○                         | ○                | ○                          | ●                  | ●                            | ●                    | ○                          |
|   | ○  | ○                            | ○  | ●  | ○  | ○                                | ○                           | ○                         | ○                | ○                          | ○                  | ●                            | ○                    | ○                          |
|   | ○  | ○                            | ○  | ○  | ○  | ○                                | ○                           | ○                         | ○                | ○                          | ○                  | ○                            | ○                    | ○                          |
| Unique Value Proposal   |  |                              |  |  |  |                                  |                             |                           |                  |                            |                    |                              |                      |                            |
| Main proposal<br>Best of the industry<br>Avg. of the industry<br>Not relevant | Product Attributes   |                              |  |  | Service Attributes   |                                  |                             |                           |                  |                            |                    |                              |                      |                            |
|   | Ratio benefits/price   | Range of portfolio           | Product adaptability                           | Price                                      | Innovation   | Time from idea to market         | Agility to demand variation | Working capital           | Lead time        | Minimum order quantity     | Perfect orders     | Order entry                  |                      |                            |
|   | ○  | ○                            | ○  | ○  | ○  | ●                                | ○                           | ○                         | ○                | ○                          | ●                  | ○                            | ○                    |                            |
|   | ○  | ○                            | ○  | ●  | ○  | ●                                | ○                           | ○                         | ○                | ○                          | ●                  | ○                            | ○                    |                            |
| Supply Chain Processes  |  |                              |  |  |  |                                  |                             |                           |                  |                            |                    |                              |                      |                            |
| Sourcing  | Plan & Make  |                              |  | Demand Fulfillment                         |  |                                  | Managerial Focus            |                           |                  |                            |                    |                              |                      |                            |
| Collaboration   | Inventory strategy   | Product                      | Collaboration                                  | Order cycle                                | Supplier's   | Product design                   |                             |                           |                  |                            |                    |                              |                      |                            |
| Cooperation to anticipate market trends and/or joint design                   | A single batch per SKU according to forecast of the collection | Continuous portfolio renewal | Cooperation to anticipate trends/ joint design | Lead time according to collection schedule | Innovativeness   | Fast product development process |                             |                           |                  |                            |                    |                              |                      |                            |
| Buffering   | Assets utilization   | Order penetration            | Buffering                                      | Minimum order                              | Transformation   | Service design                   |                             |                           |                  |                            |                    |                              |                      |                            |
| Pool of suppliers   | Very high  | Make to Forecast (MTF)       | Inventory of finished product                  | Collection pre-order                       | High rate of assets utilisation and capacity pooling for peaks | Short time from idea to market   |                             |                           |                  |                            |                    |                              |                      |                            |
|   | Production cycle   |                              |  |  |  |                                  |                             |                           |                  |                            | End to end         | Continuous portfolio renewal |                      |                            |
|   | As short as possible to reduce time to market                  |                              |  |  |  |                                  |                             |                           |                  |                            |                    |                              |                      |                            |

Figure A.2: Fast Supply Chain Strategy

## A.1 Generic Supply Chain Strategies (Archetypes)

| Business Framework |                 |                 |                |                 |                            |                       |                           |                  |                            |                         |                      |
|--------------------|-----------------|-----------------|----------------|-----------------|----------------------------|-----------------------|---------------------------|------------------|----------------------------|-------------------------|----------------------|
| Sourcing view      |                 |                 |                | Technology view |                            |                       |                           | Demand view      |                            |                         |                      |
| Complexity         | Disruption risk | Suppliers Power | Cost relevance | Maturity        | Scale of productive assets | Assets cost relevance | Gross margins in industry | Customer's power | Relevance in customer cost | Market uncertainty cost | Product renewal rate |
| Very high          | ○               | ○               | ○              | ○               | ○                          | ○                     | ○                         | ○                | ●                          | ○                       | ○                    |
| High               | ○               | ○               | ○              | ○               | ○                          | ○                     | ○                         | ○                | ●                          | ○                       | ○                    |
| Medium             | ○               | ○               | ○              | ○               | ○                          | ○                     | ○                         | ○                | ○                          | ●                       | ○                    |
| Low                | ○               | ○               | ○              | ○               | ○                          | ○                     | ○                         | ○                | ○                          | ○                       | ○                    |

| Unique Value Proposal   |                      |                    |                      |       |            |                          |                             |                 |           |                        |                |
|---|----------------------|--------------------|----------------------|-------|------------|--------------------------|-----------------------------|-----------------|-----------|------------------------|----------------|
| Product Attributes  |                      |                    |                      |       |            | Service Attributes       |                             |                 |           |                        |                |
| Main proposal<br>Best of the industry<br>Avg. of the industry<br>Not relevant | Ratio benefits/price | Range of portfolio | Product adaptability | Price | Innovation | Time from idea to market | Agility to demand variation | Working capital | Lead time | Minimum order quantity | Perfect orders |
|   | ○                    | ○                  | ○                    | ○     | ○          | ○                        | ○                           | ○               | ○         | ○                      | ○              |
|   | ●                    | ○                  | ○                    | ○     | ○          | ○                        | ○                           | ○               | ○         | ○                      | ○              |
|   | ○                    | ○                  | ○                    | ○     | ○          | ○                        | ○                           | ○               | ○         | ○                      | ○              |

| Supply Chain Processes  |  |                      |   |                              |  |   |   |  |  |  |  |
|---|--|----------------------|---|------------------------------|--|---|---|--|--|--|--|
| Plan & Make   |  |                      |   | Demand Fulfillment           |  |   |   | Managerial Focus                               |  |  |  |
| Sourcing  | Inventory strategy                                     | Product              | Collaboration   | Order cycle                  | Supplier's                                     | Product design                              | Transformation                                      | Service design                                 | End to end                                     | Collaborative relationships to build synergies | Information sharing for continuous improvement |
| Strategic relationship with key suppliers to create synergies | Small and frequent batches to increase inventory turns | Standardised product | Strategic relationship with key customer to build synergies | Fixed cycle                  | Collaborative relationships to build synergies | Fast changeover and quick manufacturability | Regular basis schedule in optimal sequence of SKU's | Information sharing for continuous improvement | As short as possible to reduce batch sizes     | Collaborative relationships to build synergies | Information sharing for continuous improvement |
| Buffering   | Assets utilization                                     | Order penetration    | Buffering   | Minimum order                | Customer replenishment needs                   | Service design                              | End to end  | Collaborative relationships to build synergies | Information sharing for continuous improvement | Collaborative relationships to build synergies | Information sharing for continuous improvement |
| Inventory and a strategic supplier for each key component     | High - very high                                       | MTS                  | Inventory of finished product                               | Customer replenishment needs | Collaborative relationships to build synergies | Fast changeover and quick manufacturability | Regular basis schedule in optimal sequence of SKU's | Information sharing for continuous improvement | As short as possible to reduce batch sizes     | Collaborative relationships to build synergies | Information sharing for continuous improvement |

Figure A.3: Continuous-flow Supply Chain Strategy

## A.1 Generic Supply Chain Strategies (Archetypes)

| Business Framework  |  |                      |   |  |  |                            |                       |                           |                        |                            |                         |                  |                      |                            |
|---|--|----------------------|---|--|--|----------------------------|-----------------------|---------------------------|------------------------|----------------------------|-------------------------|------------------|----------------------|----------------------------|
| Sourcing view   |  |                      |   | Technology view  |  |                            | Demand view           |                           |                        |                            |                         |                  |                      |                            |
|   | Complexity                                       | Disruption risk      | Suppliers Power   | Cost relevance   | Maturity   | Scale of productive assets | Assets cost relevance | Gross margins in industry | Customer's power       | Relevance in customer cost | Market uncertainty cost | Demand variation | Product renewal rate | Transport's cost relevance |
| Very high<br>High<br>Medium<br>Low  | ○  | ○                    | ○   | ○  | ○  | ○                          | ○                     | ○                         | ○                      | ○                          | ●                       | ○                | ●                    | ○                          |
|   | ○  | ○                    | ○   | ○  | ○  | ○                          | ●                     | ○                         | ○                      | ○                          | ●                       | ●                | ●                    | ○                          |
|   | ○  | ○                    | ○   | ○  | ○  | ○                          | ●                     | ○                         | ○                      | ○                          | ○                       | ○                | ○                    | ○                          |
|   | ○  | ○                    | ○   | ○  | ○  | ○                          | ●                     | ○                         | ○                      | ○                          | ○                       | ○                | ○                    | ○                          |
| Unique Value Proposal   |  |                      |   |  |  |                            |                       |                           |                        |                            |                         |                  |                      |                            |
|   | Product Attributes                               |                      |   |  | Service Attributes                                       |                            |                       |                           |                        |                            |                         |                  |                      |                            |
| Main proposal<br>Best of the industry<br>Avg. of the industry<br>Not relevant | Ratio benefits/price                             | Range of portfolio   | Product adaptability  | Time from idea to market   | Innovation   | Price                      | Working capital       | Lead time                 | Minimum order quantity | Perfect orders             | Order entry             |                  |                      |                            |
|   | ○  | ●                    | ●   | ○  | ○  | ○                          | ○                     | ○                         | ○                      | ○                          | ○                       | ○                | ○                    | ○                          |
|   | ○  | ●                    | ●   | ○  | ○  | ○                          | ○                     | ○                         | ○                      | ○                          | ○                       | ○                | ○                    | ○                          |
|   | ○  | ○                    | ○   | ○  | ○  | ○                          | ○                     | ○                         | ○                      | ○                          | ○                       | ○                | ○                    | ○                          |
| Supply Chain Processes  |  |                      |   |  |  |                            |                       |                           |                        |                            |                         |                  |                      |                            |
| Sourcing  |  |                      | Plan & Make   |  | Demand Fulfillment                                       |                            |                       | Managerial Focus          |                        |                            |                         |                  |                      |                            |
| Collaboration   | Inventory strategy                               | Product              | Collaboration   | Order cycle  | Supplier's   | Product design             |                       |                           |                        |                            |                         |                  |                      |                            |
| Cooperation with key suppliers to anticipate aggregate demand at family level | Materials/ components under a common platform    | Customisable product | Cooperation with some key customers to anticipate capacity requirements | As short as possible according to orders in queue                          | Shortest lead time                                       | Designed for small batches |                       |                           |                        |                            |                         |                  |                      |                            |
| Buffering   | Assets utilization                               | Order penetration    | Buffering   | Minimum order quantity   | Transformation   | Service design             |                       |                           |                        |                            |                         |                  |                      |                            |
|   | Medium   | MTO                  | Extra capacity  | Minimum economic production batch or minimum economic transportation batch | Extra capacity in manufacturing and downstream processes | Short lead time            |                       |                           |                        |                            |                         |                  |                      |                            |
|   | Production cycle                                 |                      |   |  |  | End to end                 |                       |                           |                        |                            |                         |                  |                      |                            |
| Inventory and pool of suppliers   | Variable according to customer accepted in queue |                      |   |  |  | Adaptability to demand     |                       |                           |                        |                            |                         |                  |                      |                            |

Figure A.4: Agile Supply Chain Strategy



## A.1 Generic Supply Chain Strategies (Archetypes)

| Business Framework  |  |                    |  |  |   |                                     |   |                           |                  |                            |                    |                  |                      |                            |
|---|--|--------------------|--|--|---|-------------------------------------|---|---------------------------|------------------|----------------------------|--------------------|------------------|----------------------|----------------------------|
| Sourcing view   |  |                    |  |  | Technology view                                       |                                     |   |                           | Demand view      |                            |                    |                  |                      |                            |
| Very high<br>High<br>Medium<br>Low  | Complexity   | Disruption risk    | Suppliers Power                                      | Cost relevance   | Maturity  | Scale of productive assets          | Assets cost relevance                     | Gross margins in industry | Customer's power | Relevance in customer cost | Market uncertainty | Demand variation | Product renewal rate | Transport's cost relevance |
|   | ○  | ○                  | ○  | ○  | ○   | ○                                   | ○   | ○                         | ○                | ○                          | ○                  | ○                | ●                    | ○                          |
|   | ○  | ○                  | ○  | ○  | ○   | ○                                   | ○   | ○                         | ○                | ○                          | ○                  | ○                | ●                    | ○                          |
|   | ○  | ○                  | ○  | ○  | ○   | ○                                   | ○   | ○                         | ○                | ○                          | ○                  | ○                | ○                    | ○                          |
| Unique Value Proposal   |  |                    |  |  |   |                                     |   |                           |                  |                            |                    |                  |                      |                            |
| Main proposal<br>Best of the industry<br>Avg. of the industry<br>Not relevant | Product Attributes                                   |                    |  |  | Service Attributes                                    |                                     |   |                           |                  |                            |                    |                  |                      |                            |
|   | Ratio benefits/price                                 | Range of portfolio | Product adaptability                                 | Price  | Innovation  | Time from idea to market            | Agility to demand variation               | Working capital           | Lead time        | Minimum order quantity     | Perfect orders     | Order entry      |                      |                            |
|   | ○  | ●                  | ●  | ○  | ○   | ○                                   | ●   | ○                         | ○                | ●                          | ○                  | ●                |                      |                            |
|   | ○  | ○                  | ○  | ○  | ○   | ○                                   | ●   | ○                         | ○                | ○                          | ○                  | ○                |                      |                            |
| Supply Chain Processes  |  |                    |  |  |   |                                     |   |                           |                  |                            |                    |                  |                      |                            |
| Sourcing  |  | Plan & Make        |  |  | Demand Fulfillment                                    |                                     |   | Managerial Focus          |                  |                            |                    |                  |                      |                            |
| Collaboration   | Inventory strategy                                   | Product            | Inventory just before product decoupling point (PDP) | Configurable order   | Collaboration   | Order cycle                         | Supplier's                                | Product design            |                  |                            |                    |                  |                      |                            |
| Cooperation with key suppliers to anticipate aggregate demand at family level | Inventory just before product decoupling point (PDP) | Configurable order |  | Cooperation with key customers to anticipate aggregate demand at PDP | As short as possible according to orders in PDP queue | Agile response to changes in demand | Modular design for multiple configuration |                           |                  |                            |                    |                  |                      |                            |
| Buffering   | Assets utilization                                   | Order penetration  | Buffering  | Minimum order quantity   | Transformation  | Service design                      |   |                           |                  |                            |                    |                  |                      |                            |
| Inventory and pool of suppliers   | High before PDP, medium in PDP and after             | Configure to order | Inventory before PDP, extra capacity after PDP       | End consumer needs or customer replenishment needs                   | High rate of asset utilisation before PDP             | Order accuracy                      |   |                           |                  |                            |                    |                  |                      |                            |
|   | Production cycle                                     |                    |  |  |   |                                     |   | End to end                |                  |                            |                    |                  |                      |                            |
|   | Long before PDP, Short in PDP and downstream         |                    |  |  |   |                                     |   | Product configurability   |                  |                            |                    |                  |                      |                            |

Figure A.5: Custom-configured Supply Chain Strategy

## A.1 Generic Supply Chain Strategies (Archetypes)

| Business Framework  |   |                     |   |                                  |   |   |                       |                           |                        |                            |                         |                  |                      |                            |
|---|---|---------------------|---|----------------------------------|---|---|-----------------------|---------------------------|------------------------|----------------------------|-------------------------|------------------|----------------------|----------------------------|
| Sourcing view   |   |                     |   | Technology view                  |   |   | Demand view           |                           |                        |                            |                         |                  |                      |                            |
| Very high<br>High<br>Medium<br>Low  | Complexity                                | Disruption risk     | Suppliers Power                                     | Cost relevance                   | Maturity  | Scale of productive assets                    | Assets cost relevance | Gross margins in industry | Customer's power       | Relevance in customer cost | Market uncertainty cost | Demand variation | Product renewal rate | Transport's cost relevance |
|   | ○   | ○                   | ○   | ○                                | ○   | ○   | ○                     | ○                         | ○                      | ○                          | ●                       | ○                | ○                    | ○                          |
|   | ○   | ○                   | ○   | ○                                | ○   | ○   | ○                     | ○                         | ○                      | ○                          | ○                       | ○                | ○                    | ○                          |
|   | ○   | ○                   | ○   | ○                                | ○   | ○   | ●                     | ○                         | ○                      | ○                          | ○                       | ○                | ○                    | ○                          |
| Unique Value Proposal   |   |                     |   |                                  |   |   |                       |                           |                        |                            |                         |                  |                      |                            |
| Main proposal<br>Best of the industry<br>Avg. of the industry<br>Not relevant | Product Attributes                        |                     |   |                                  | Service Attributes                                    |   |                       |                           |                        |                            |                         |                  |                      |                            |
|   | Ratio benefits/price                      | Range of portfolio  | Product adaptability                                | Time from idea to market         | Innovation  | Agility to demand variation                   | Working capital       | Lead time                 | Minimum order quantity | Perfect orders             | Order entry             |                  |                      |                            |
|   | ○   | ●                   | ●   | ○                                | ○   | ●   | ○                     | ○                         | ○                      | ○                          | ○                       | ○                | ○                    | ○                          |
|   | ○   | ●                   | ○   | ○                                | ○   | ○   | ○                     | ○                         | ○                      | ○                          | ○                       | ○                | ○                    | ○                          |
| Supply Chain Processes  |   |                     |   |                                  |   |   |                       |                           |                        |                            |                         |                  |                      |                            |
| Sourcing  |   | Plan & Make         |   | Demand Fulfillment               |   |   | Managerial Focus      |                           |                        |                            |                         |                  |                      |                            |
| Collaboration   | Inventory strategy                        | Product             | Collaboration                                       | Order cycle                      | Supplier's  | Product design                                |                       |                           |                        |                            |                         |                  |                      |                            |
| Understanding suppliers "available to promise" at any time                    | Low inventory level and inventory pooling | Adaptable processes | Understanding of available to promise at any moment | Variable, as short as possible   | Process flexibility to adapt to customer requirements | Supported by complimentary services           |                       |                           |                        |                            |                         |                  |                      |                            |
| Buffering   | Assets utilization                        | Order penetration   | Buffering   | Minimum order                    | Transformation  | Service design                                |                       |                           |                        |                            |                         |                  |                      |                            |
| Pool of suppliers for critical resources                                      | Low - medium                              | Design to order     | Stand by capacity and capacity pooling              | End consumer/ end consumer needs | Assets flexibility and capacity pooling               | Understanding and adaptable to customer needs |                       |                           |                        |                            |                         |                  |                      |                            |
|   | Production cycle                          |                     |   |                                  |   | End to end                                    |                       |                           |                        |                            |                         |                  |                      |                            |
|   | As short as possible to reduce lead time  |                     |   |                                  |   | Process adaptability                          |                       |                           |                        |                            |                         |                  |                      |                            |

Figure A.6: Flexible Supply Chain Strategy

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**A.2 Ten Common Supply Chain Patterns**

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**A.2 Ten Common Supply Chain Patterns**

Table A.1: Ten Common Patterns

| <b>Patterns from Business Framework</b> | <b>Patterns from UVP</b> |
|---|--------------------------|
| Low challenging sourcing                | Perfect orders           |
| High challenging sourcing               | Broad portofolio         |
| Commoditised industries                 | Short lead time          |
| Evolving industries                     | Evolving portofolio      |
| High relevance of transport cost        | Low inventory            |

## Appendix B

# Project Metrics

Table B.1: Performance Measurement Framework Metrics Description and Calculation

| Metric                                       | Description   | Calculation  |
|--|---|--|
| <b>Reliability</b>                           |   |  |
| Perfect order fulfilment                     | The percentage of orders meeting delivery performance with complete and accurate documentation and no delivery damage.                  | $\frac{[\text{Total number of perfect orders}]}{[\text{Total number of orders}]} \times 100\%$ |
| % Orders delivered in full                   | Percentage of orders which all of the items are received by customer in the quantities committed.                                       | $\frac{\text{Number of correct orders}}{\text{Total number of orders}}$                        |
| Delivery performance to customer commit date | Percentage of orders which all of the items are received by customer on-time  | $\frac{\text{Number of on-time orders}}{\text{total number of orders}}$                        |
| Documentation accuracy                       | Percentage of orders which all of the items are received by customer with correct documentation   | $\frac{\text{Number of orders with perfect documentation}}{\text{total number of orders}}$     |
| Orders delivered in perfect condition        | Percentage of orders which all of the items are received by customer in a perfect condition   | $\frac{\text{Number of perfect orders (product condition)}}{\text{total number of orders}}$    |
| Dry goods supplier order accuracy            | It measures the suppliers performance (including the average of claims made by the winery to the supplier in a specific period of time) | $\frac{\text{Number of perfect purchase orders}}{\text{Total orders placed}}$                  |

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| Metric                                 | Description  | Calculation   |
|--|--|---|
| <b>Responsiveness</b>                  |  |   |
| Order fulfillment cycle time           | The average actual cycle time consistently achieved to fulfill customer orders. For each individual order, this cycle time starts from the order receipt and ends with customer acceptance of the order. | Time from order placement until delivery at customer. |
| Internal order cycle time              | It measures the time from order placement until the order is ready to be loaded for delivery. Dwell time should be excluded.   | Time from order placement until order is shipped.     |
| Source cycle time (Standard dry goods) | It measures the time from order placement until the order is received.   | Time from order placement to delivery                 |

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| Metric  | Description   | Calculation  |
|---|---|--|
| <b>Agility</b>                                |   |  |
| Average resource utilization of all equipment | It measures the average utilisation level of the cellar's resources with a specific period of time as compared to the total capacity of resources.                          | Sum of all machines (total hours used/ Total hours available)/ number of machines  |
| Resource utilization                          | It measures the resource utilisation level of each main assets involved in packaging over a specific period of time as compared to the installed capacity of each resource. | Total products packaged per asset / Total capacity of asset  |
| Deliver demand variation                      | It measures the percentage increase or decrease in sales (volume) from the average annual sales.  | (Monthly volume sold - Average monthly volume sold)/ Average monthly volume sold   |
| <b>Cost</b>                                   |   |  |
| Total logistics cost                          | It is the aggregated cost of all logistics activities considered in a specific period of time.  | Sum of supplier logistic cost, production logistics cost, inventory cost, warehousing cost, transportation cost, return logistics cost, customer response logistics cost |
| Sourcing cost relevance                       | The magnitude of the cost of sourced materials and/or components compared to the total cost of the finished product.  | [Total cost of products purchased for making wine] / Cost of goods sold  |
| Packaging cost                                | Specifies the relative importance of the cost of transportation in the total cost of the product.   | Total transportation cost/sales (R). (Own vehicle cost: Depreciation for the year + fuel costs. Outsourced: Total transportation cost invoiced)                          |
| Transportation cost relevance                 | Packaging cost per volume packaged.   | Total cost of packaging material and labour / Total volume packaged. (outsourced or in-sourced)  |

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| Metric                                    | Description   | Calculation  |
|---|---|--|
| <b>Assets</b>                             |   |  |
| Cash-to-cash cycle time                   | The time it takes for an investment made to flow back into a company after it has been spent for raw materials                        | Inventory days of supply (finished goods) + Debtors days - Creditors days            |
| Inventory days of supply - Finished goods | The amount of finished goods inventory expressed in days of sales.  | Average Inventory (L)/ Volume sold (L) per period                                    |
| Inventory days of supply - Dry goods      | The amount of dry goods inventory expressed in days of sales.   | Total value of dry goods stored / Value of dry goods used for production per period. |
| Creditors days                            | The length of time from purchasing materials (dry goods, raw materials) and labor until cash payments must be made expressed in days. | Average accounts payable / (total material purchases/365)                            |
| Debtors days                              | The length of time from when a sale is made until the cash is received from customers. The amount of sales expressed in days.         | Accounts receivable / (total sales/365)  |

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Table B.2: Measurement Results Round 1

| Round 1 Measurement         | Unit | All Segments | Packaged Local |
|-----------------------------|------|--------------|----------------|
| Inventory Days of Supply    | Days | 205.64       | 42.85          |
| Order Fulfilment Cycle Time | Days | 12.13        | 3              |
| Perfect Order Fulfilment    | %    | 93           | 94             |
| Storage Cost                |      | 0.046        | 0.044          |
| Transportation Cost         |      | 0.36         | 0.95           |
| Upside SC Flexibility       | Days | 20.53        | 16.25          |



Table B.3: Measurement Results Round 2 - Dry Goods Inventory

| <b>Round 2 Measurements</b>             |                 |                  |
|---|-----------------|------------------|
| <b>Average of All Packaged products</b> |                 |                  |
|   | Inventory (R/l) | Lead Time (Days) |
| Bottles                                 | R 0.52          | 9.73             |
| Corks                                   | R 0.83          | 8.00             |
| Labels                                  | R 1.82          | 15.43            |
| Capsules                                | R 1.86          | 20.21            |
| Boxes                                   | R 2.74          | 16.79            |
| Total value                             | R7.29           |                  |

Table B.4: Metrics used for Framework and Practical Measures

| Metrics                                       | Metrics Included |         |           |
|---|------------------|---------|-----------|
|   | Round 1          | Round 2 | Framework |
| Perfect order fulfilment                      | 1                | 1       | 1         |
| % of Orders delivered in full                 | 1                | 1       | 1         |
| Documentation accuracy                        |                  |         | 1         |
| Perfect condition                             |                  |         | 1         |
| Dry goods supplier order accuracy             |                  |         | 1         |
| Order fulfillment cycle time                  | 1                | 1       | 1         |
| Internal order cycle time                     | 1                | 1       | 1         |
| Source cycle time                             |                  | 1       | 1         |
| Average resource utilization of all equipment |                  |         | 1         |
| Resource utilization                          |                  |         | 1         |
| Deliver demand variation                      |                  |         | 1         |
| Downside deliver adaptability                 | 1                |         |           |
| Upside deliver adaptability                   | 1                |         |           |
| Total Logistics cost                          |                  |         | 1         |
| Sourcing cost relevance                       |                  |         | 1         |
| Transportation cost relevance                 | 1                |         | 1         |
| Packaging cost                                |                  |         | 1         |
| Inventory days of supply - finished goods     | 1                | 1       | 1         |
| Inventory days of supply - Dry goods          |                  | 1       | 1         |
| Creditors days                                |                  | 1       | 1         |
| Debtors days                                  |                  | 1       | 1         |

Table B.5: Availability of Information for Metric

| Metrics  | Mostly<br>Availabe | Ocasionally<br>Available | Not<br>Available |
|--|--------------------|--------------------------|------------------|
| Reliability                                      |                    |                          |                  |
| Perfect order fulfilment                         | 1                  |                          |                  |
| % of Orders delivered in full                    |                    | 1                        |                  |
| Documentation accuracy                           |                    |                          | 1                |
| Perfect condition                                |                    | 1                        |                  |
| Dry goods supplier order accuracy                |                    |                          |                  |
| Responsiveness                                   |                    |                          |                  |
| Order fulfillment cycle time                     |                    | 1                        |                  |
| Internal order cycle time                        |                    | 1                        |                  |
| Source cycle time                                |                    | 1                        |                  |
| Agility  |                    |                          |                  |
| Average resource utilization of all<br>equipment |                    | 1                        |                  |
| Resource utilization                             |                    | 1                        |                  |
| Deliver demand variation                         |                    |                          |                  |
| Downside deliver adaptability                    |                    |                          | 1                |
| Upside deliver adaptability                      |                    |                          |                  |
| Cost   |                    |                          |                  |
| Total Logistics cost                             |                    |                          | 1                |
| Sourcing cost relevance                          |                    |                          | 1                |
| Transportation cost relevance                    |                    | 1                        |                  |
| Packaging cost                                   |                    | 1                        |                  |
| Assets   |                    |                          |                  |
| Inventory days of supply - finished goods        | 1                  |                          |                  |
| Inventory days of supply - Dry goods             |                    | 1                        |                  |
| Creditors days                                   |                    | 1                        |                  |
| Debtors days                                     |                    | 1                        |                  |

## Appendix C

# Questionnaire and Interview Questions

### C.1 Questionnaire

## C.1 Questionnaire

| Wine Supply Chain Survey  |                      |
|---|----------------------|
| <b>1. Generic questions</b>   |                      |
| <b>*1. Where is your cellar located?</b>  |                      |
| <input type="text"/>  |                      |
| <b>2. Which company does your auditing?</b>   |                      |
| <input type="checkbox"/> PwC  |                      |
| <input type="checkbox"/> KPMG   |                      |
| <input type="checkbox"/> Deloitte   |                      |
| <input type="checkbox"/> Ernst and Young  |                      |
| Other (please specify)  |                      |
| <input type="text"/>  |                      |
| <b>3. Which accreditation(s) do you comply to?</b>  |                      |
| <input type="checkbox"/> Fairtrade  |                      |
| <input type="checkbox"/> WIETA  |                      |
| <input type="checkbox"/> IPW  |                      |
| <input type="checkbox"/> ISO 9000   |                      |
| Other (please specify)  |                      |
| <input type="text"/>  |                      |
| <p>You may participate in one or more of the segments provided below. If you do not participate in a specific segment, fill in a zero (0) in the box next to the segment.</p> |                      |
| <b>*4. Total volume sold per segment from 1 January 2014 to 31 December 2014 (litres).</b>  |                      |
| Packaged Export   | <input type="text"/> |
| Packaged Local  | <input type="text"/> |
| Bulk Export   | <input type="text"/> |
| Bulk Local  | <input type="text"/> |
| <b>*5. Please estimate the % of wine not sold for the year 2014 (1 Jan 2014 to 31 Dec 2014) which you planned to sell?</b>  |                      |
| Percentage  | <input type="text"/> |

## Wine Supply Chain Survey

### 3. Packaged Local (1 out of 2)

Please complete the following questions only for PACKAGED LOCAL products.

**\*7. Please estimate the % of orders, during 2014, for which you had all the required products in a stock buffer? (No bottling, labeling or rework had to be done).**

**8. Please indicate which type of customers you sell directly to in the local market. NB: If products are distributed to retailers or restaurants via a distributor/agent (Vinimark, Meridian etc.) the distributor/agent should be seen as the customer .**

☐ Restaurants

☐ Distributor/Agent

☐ Retailer

Other (please specify)

**\*9. How much did you sell to each of these customers in 2014 (% of locally sold volume)?**

|                   |                      |
|-------------------|----------------------|
| Restaurants       | <input type="text"/> |
| Distributor/Agent | <input type="text"/> |
| Retailer          | <input type="text"/> |
| Other             | <input type="text"/> |

Note: For further questions it is not necessary to provide answers for customer types that are not served. Leave the options blank if a customer type is not served.

**\*10. To which customers do you use outsourced transportation? Provide separate answers for regional deliveries (own province) as well as national deliveries.**

|                   | Own Province         | National             |
|-------------------|----------------------|----------------------|
| Restaurants       | <input type="text"/> | <input type="text"/> |
| Distributor/Agent | <input type="text"/> | <input type="text"/> |
| Retailer          | <input type="text"/> | <input type="text"/> |

Comments

Wine Supply Chain Survey

11. Please provide the names of all the distributor(s)/agent(s) you use for deliveries to the local market.

1

2

3

4

5

## Wine Supply Chain Survey

### 4. Packaged Local (2 out of 2)

Please complete the following questions only for PACKAGED LOCAL products.

**\* 12. Do you impose minimum order sizes for orders from local customers? (Yes/No)**

|                   | Yes                   | No                    |
|-------------------|-----------------------|-----------------------|
| Restaurants       | <input type="radio"/> | <input type="radio"/> |
| Distributor/Agent | <input type="radio"/> | <input type="radio"/> |
| Retailer          | <input type="radio"/> | <input type="radio"/> |

**\* 13. How would you describe the demand variation experienced from each customer type?**

|                   | Low                   | Medium                | High                  | Unpredictable         |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Restaurants       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Distributor/Agent | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Retailer          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Comments

**\* 14. Please answer Yes or No to the following questions to describe the type of relationship you have with each local customer type. If customers within a group are not consistent, consider the customer that orders the largest volume.**

|                   | Do you receive information about the amount of your products which your customer stores and sells? | Would you regard the relationship as a long term relationship? | Joint product development? |
|-------------------|--|--|----------------------------|
| Restaurants       | <input type="text"/>   | <input type="text"/>   | <input type="text"/>       |
| Distributor/Agent | <input type="text"/>   | <input type="text"/>   | <input type="text"/>       |
| Retailer          | <input type="text"/>   | <input type="text"/>   | <input type="text"/>       |

Comments



## C.2 Distributor Questions

## C.2 Distributor Questions

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|   |  |
|---|--|
| <b>Cellar – Distributor</b>   |  |
| How do you segment suppliers?   |  |
| What type of forecasts do you provide to suppliers? (Annual, monthly, per product, per delivery point...)                         |  |
| What do you require from suppliers in terms of product renewals? How often is the variety of products offered discussed/ changed? |  |
| Do you expect suppliers to customize products? Or do you collaborate with suppliers about product development?                    |  |
| What is the total volume sold to customer type in 2014?   |  |
| What do you require from suppliers in terms of cycle times?   |  |
| What do you require from suppliers in terms of order fulfilment rates?  |  |
| Do you require any other specific performance metrics from suppliers?   |  |

## C.2 Distributor Questions

| Distributor - Customer  |  |
|---|--|
| How do you segment your customers? (List the segments used)   |  |
| How would you describe the demand variation from each type of customer? (Low, medium, high, unpredictable)  |  |
| <p>Market uncertainty cost refers to the costs associated with the imbalance of demand and supply, which is composed of the markdown of products for compensating excess of supply and profit gained when demand exceeds supply.</p> <p>How would you describe the market uncertainty cost associated with customers? (descriptions for low, medium and high uncertainty can be used as a guideline)</p> <p>Low= no price reductions, demand is stable.<br/> Medium= sometimes prices have to be marked down.<br/> high=successful products often sell out quickly and unsuccessful products are marked down.</p> |  |
| What type of forecasts do customers provide? (Annual, monthly, per product, per delivery point...)  |  |
| What are the requirements from customers in terms of product renewals? How often is the variety of products offered discussed/ changed?   |  |
| Do you customize products for customers?  |  |
| What is the total volume sold to customer type in 2014?   |  |
| Do customers require minimum cycle times? (Time from order placement to delivery)   |  |
| Do customers require a certain order fulfilment rate? (eg. 95% of all orders must be perfect)   |  |
| Do customers require any other specific performance metrics?  |  |

## Appendix D

# Evaluation of Local Industry

Table D.1: Evaluation and description of Industry

| <b>Characteristic of Business Framework</b> | <b>Description of evaluation</b>  | <b>Evaluation</b> |
|---|---|-------------------|
| <b>Sourcing view</b>                        |   |                   |
| <b>Sourcing complexity</b>                  | Two of the three sourcing variables (sourced SKUs, number of suppliers, or sourcing lead time) becomes greater and creates relevant complexity for the management.  | High              |
| <b>Disruption risk of sourcing</b>          | At this level, several alternative suppliers are available on relatively short notice. Continuity of operations is usually not disrupted.   | Medium            |
| <b>Supplier's power</b>                     | At this level, there exist a market with a balance between demand and supply. There is a high level of entry barriers to global suppliers. However, when global prices reduce in a level that matches domestic prices, local suppliers will lose power. | Medium            |
| <b>Sourcing cost relevance</b>              | The cost added by the transformation process and supplies costs are of similar magnitude within the cost of goods sold.   | High              |
| <b>Technology view</b>                      |   |                   |
| <b>Technology maturity</b>                  | At this level, technology undergoes some sporadic changes, which can generate minor differentiations in the production processes among manufacturers for short periods of time.   | high              |
| <b>Scale of productive assets</b>           | New productive assets has significant relevance in the balance of supply and demand (5-10 %)  | Medium - high     |
| <b>Relevance of assets in total cost</b>    | A decrease in the rate of utilisation of assets of 30%-40% may influence financial performance.   | Medium            |

---

| <b>Characteristic of Business Framework</b>   | <b>Description of evaluation</b>   | <b>Evaluation</b> |
|---|--|-------------------|
| <b>Demand view</b>                            |  |                   |
| <b>Gross margins in industry</b>              | It is a category with a very low gross margin (<20%)   | Very high         |
| <b>Relevance in customer's cost structure</b> | The cost of the product or category of products is probably the most important components in the client's cost structure. The customer maintains a permanent and strict view of the price in the domestic and global market. | Very high         |
| <b>Market uncertainty cost</b>                | It is common that successful products are out of stock and unsuccessful products require price reductions.   | High              |
| <b>Transport cost relevance</b>               | The relationship of product price per cube is low because the cost of transportation is highly significant (>10%) in the cost structure. Full truckloads is compulsory to optimise transportation cost.                      | Very high         |
| <b>Customer's power</b>                       | The clients dominate the market, supply exceeds demand and multiple alternatives of sourcing exist as well as substitutable products.  | Very high         |
| <b>Demand variation</b>                       | The demand profile has high size peaks (around 50% of the average demand).   | High              |
| <b>Product renewal rate</b>                   | Products are renewed on an annual basis, affected by fashion or changes in technology.   | Medium            |

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## D.1 Wine Industry Common Patterns

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### D.1 Wine Industry Common Patterns

Table D.2 lists the patterns, characteristics and the recommended configuration or solution. The characteristic that is relevant to the local wine industry is indicated in green. The solution refers to the prescribed configuration of supply chain processes that should be implemented when any of the characteristics listed in the table is present in an industry.

Table D.2: Common Patterns in the Local Wine Industry

| Patterns from Business Framework        | Characteristics                  | Solution / Best Practice              |
|---|----------------------------------|---------------------------------------|
| <b>High challenging sourcing</b>        | Sourcing complexity              | Sourcing buffering:                   |
|   | Disruption risk                  | Inventory & pool of suppliers         |
|   | Supplier's power                 |                                       |
| <b>Commoditised industries</b>          | Maturity                         | Assets utilization:                   |
|   | Assets scale                     | High - very high                      |
|   | Gross margins                    |                                       |
|   | Customer's power                 |                                       |
|   | Relevance in customer cost price |                                       |
| <b>Evolving industries</b>              | Market uncertainty cost          | Assets utilization:                   |
|   | Demand variation                 | Medium                                |
|   | Agility to demand variation      |                                       |
| <b>High relevance of transport cost</b> | Relevance in customer cost       | Minimum order quantity:               |
|   | Transportation cost relevance    | Minimum economic transportation batch |
|   | Minimum order quantity           |                                       |

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